153761

[redacted]

PYROFRAC A-320 B-320 C-320

PIEDMONT MINERALS

[redacted]

[redacted]

U.S. DEPARTMENT OF LABOR

Occupational Safety and Health Administration

OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Pyrofrac
Pyrophyl
Pyrotrol
(11-85)
Alpatrol
Seriphyl

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
Piedmont Minerals Company, Incorporated	(919) 292-0949

ADDRESS (Number, Street, City, State, and ZIP Code): 3514 West Wendover Avenue, Greensboro, North Carolina 27407-0247

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Andalusite, Pyrophyllite, Quartz (silica), Sericite	See Attachment
CHEMICAL FAMILY	**FORMULA**
Aluminum - Silicates	See Attachment

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS		N/A	BASE METAL		N/A
CATALYST		N/A	ALLOYS		N/A
VEHICLE		N/A	METALLIC COATINGS		N/A
SOLVENTS		N/A	FILLER METAL PLUS COATING OR CORE FLUX		N/A
ADDITIVES		N/A	OTHERS		N/A
OTHERS		N/A			

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
N/A		

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	N/A	SPECIFIC GRAVITY (H_2O=1)	2.85
VAPOR PRESSURE (mm Hg.)	N/A	PERCENT, VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=1)	N/A	EVAPORATION RATE (_____ =1)	N/A
SOLUBILITY IN WATER	Insoluble		

APPEARANCE AND ODOR: White to off-white, granular to powder, no odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
N/A	N/A		

EXTINGUISHING MEDIA: N/A

SPECIAL FIRE FIGHTING PROCEDURES: N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS: N/A

(Continued on reverse side)

C01370

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
0.53 MG/M^3

EFFECTS OF OVEREXPOSURE
Inhalation of dust over a prolonged period of time may cause injury to lungs. Airborne dust may be irritating to eyes.

EMERGENCY AND FIRST AID PROCEDURES
N/A

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID N/A
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*
N/A

HAZARDOUS DECOMPOSITION PRODUCTS
N/A

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID N/A
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Clean up by recommended dustless methods (water or vacuum).
DO NOT EXCEED TLV AS SHOWN ABOVE.

WASTE DISPOSAL METHOD
Disposal shall be in accordance with federal, state and local regulations.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*
When TLV is exceeded, NIOSH/MSHA approved respirators are required.

VENTILATION	LOCAL EXHAUST: Sufficient to keep dust below TLV	SPECIAL: None
	MECHANICAL *(General)*: Bag type dust collector recommended	OTHER: None

PROTECTIVE GLOVES: None required	EYE PROTECTION: Recommended

OTHER PROTECTIVE EQUIPMENT
None required

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Use dustless systems for handling, storage, and clean up not to exceed TLV shown above.

OTHER PRECAUTIONS
Practice good housekeeping and utilize adequate ventilation and dust collection equipment. Use respirators when TLV is exceeded.

GPO 934-180

PIEDMONT MINERALS COMPANY, INCORPORATED

Subsidiary of RESCO Products, Inc.

P. O. BOX 7247 / GREENSBORO, N. C. 27407-0247 / TELEPHONE 919-292-0949

November 15, 1985

TRADE NAME

Pyrofrac A-320, B-320, C-320
Pyrofrac A-720
Pyrofrac A-202
Pyrophyl A-100, B-100, C-100, D-100
Pyrophyl A-140, B-140
Pyrophyl A-202, B-202
Pyrotrol W-200
Pyrotrol W-325
Pyrotrol R-065
Pyrotrol R-200
Alkatrol 213
Alkatrol 226
Seriphyl A, B, C, D, G

FORMULA

Andalusite	$Al_2O_3 \cdot SiO_2$
Pyrophyllite	$Al_2O_3 \cdot 4SiO_2 \cdot H_2O$
Quartz	SiO_2
Sericite	$(K_2O, NaO) \cdot 3Al_2O_3 \cdot 6SiO_2 \cdot H_2O$

AmeriGas

INDUSTRIAL GASES DIVISION
P.O. BOX 965
VALLEY FORGE, PA 19482

EMERGENCY PHONE NUMBERS:
(215) 337-8900—Valley Forge, PA
(415) 229-3050—Martinez, CA
(713) 944-1924—So. Houston, TX
(414) 258-6970—West Allis, WI

ACETYLENE
MATERIAL SAFETY DATA SHEET

PRODUCT NAME Acetylene	CAS # 74-86-2
TRADE NAME AND SYNONYMS Acetylene, Ethyne	DOT I.D. No.: UN 1001
CHEMICAL NAME AND SYNONYMS Acetylene	DOT Hazard Class: Flammable gas
ISSUE DATE AND REVISIONS 25 November 1985	Formula: C_2H_2
	Chemical Family: Alkyne

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT Acetylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg. (ACGIH, 1985-86)

SYMPTOMS OF EXPOSURE

Inhalation: Low concentrations (10-20% in air) cause symptoms similar to that of being intoxicated. Higher concentrations so as to exclude an adequate supply of oxygen to the lungs cause unconsciousness.

TOXICOLOGICAL PROPERTIES

As a narcotic gas or intoxicant causes hypercapnia (an excessive amount of carbon dioxide in the blood). Repeated exposures to tolerable levels has not shown deleterious effects. The major property is the exclusion of an adequate supply of oxygen to the lungs.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO ACETYLENE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Flammable over an extremely wide range in air. Explosive reactions may occur on ignition. Reacts explosively with halogens and halogenated compounds.

PHYSICAL DATA

BOILING POINT Sublimation point = -118.8°F (-83.8°C)	LIQUID DENSITY AT BOILING POINT @ -116°F (-82°C) = 38.8 lb/ft^3 (622 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C): 645 psia (4450 kPa)	GAS DENSITY AT 70°F. 1 atm .0691 lb/ft^3 (1.107 kg/m^3)
SOLUBILITY IN WATER Soluble	FREEZING POINT -113°F (-80.6°C)
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) @ 68°F (20°C) = 0.906

APPEARANCE AND ODOR Pure acetylene is a colorless gas with an ethereal odor. Commercial (carbide) acetylene has a distinctive garlic-like odor.

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) Gas	AUTO IGNITION TEMPERATURE 565°F (296°C)	FLAMMAGLE LIMITS % BY VOLUME See last page LEL 2.2 UEL 80-85

EXTINGUISHING MEDIA Carbon dioxide; dry chemical	ELECTRICAL CLASSIFICATION Class 1, Group A

SPECIAL FIRE FIGHTING PROCEDURES
If possible, stop flow of escaping gas. Use water spray to cool surrounding containers. Keep personnel away since heated or burning cylinders can rupture violently.

UNUSUAL FIRE AND EXPLOSION HAZARDS GASEOUS ACETYLENE IS SPONTANEOUSLY COMBUSTIBLE IN AIR AT PRESSURES ABOVE 30 PSIA (207 kPa). It requires a very low ignition energy so that fires which have been extinguished without stopping the flow of gas can easily reignite with possible explosive force. (Continued on last page.)

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable	X	Do not allow the free gas (outside of cylinder) to exceed 30 psia. Cylinders should not be exposed to sudden shock or sources of heat.
Stable		

INCOMPATIBILITY (Materials to avoid) Oxygen and other oxidizers including all of the halogens and halogen compounds. (Continued on last page.)

HAZARDOUS DECOMPOSITION PRODUCTS
Carbon and hydrogen

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
Hood with forced ventilation.	To prevent accumulation above the LEL.	N/A
	MECHANICAL (Gen.) In accordance with electrical codes.	OTHER N/A

PROTECTIVE GLOVES
PVC or rubber in laboratory; as required for cutting and welding.

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes, safety shower

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Acetylene DOT Hazard Class: Flammable gas
DOT Shipping Label: Flammable gas I.D. No.: UN 1001

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use pcint. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when removing gas from the cylinder. DO NOT ALLOW THE FREE GAS TO EXCEED 30 PSIA (207 kPa) @ 70°F (21.1°C). Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional recommendations, consult Compressed Gas Association's Pamphlets G-1, P-1, P-14 and Safety Bulletin SB-2.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders must be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional recommendations, consult Compressed Gas Association's Pamphlets G-1, P-1, P-14, and Safety Bulletin SB-2.

SPECIAL PACKAGING RECOMMENDATIONS Since acetylene will explode or combust if its pressure exceeds 30 psia (207 kPa) it is shipped dissolved in acetone or dimethylformamide which is dispersed in a porous mass within the cylinder. Follow your supplier's instructions for the maximum withdrawal rate for each size cylinder so that solvent is not withdrawn with the acetylene.

Most metals except silver, copper, mercury or brasses with more than 66% copper are compatible (non corrosive) with acetylene.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Earth-ground and bond all lines and equipment associated with the acetylene system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

FIRE AND EXPLOSION HAZARD DATA (Continued)

UEL: (Continued)

Pure acetylene can ignite by decomposition above 30 psia (207 kPa); therefore, the UEL is 100% if the ignition source is of sufficient intensity.

FIRE AND EXPLOSION HAZARD DATA (Continued)

UNUSUAL FIRE AND EXPLOSION HAZARDS: (Continued)

Acetylene has a density very similar to that of air so when leaking it does not readily dissipate.

REACTIVITY DATA (Continued)

INCOMPATIBILITY: (Continued)

Forms explosive acetylide compounds with copper, mercury, silver, brasses containing more than 66% copper and brazing materials containing silver or copper.

FIRE AND EXPLOSION HAZARD DATA (Continued)

FLAMMABLE LIMITS % BY VOLUME: (Continued)

Pure acetylene can ignite by decomposition above 30 psia (207 kPa); therefore, the UEL is 100% if the ignition source is of sufficient intensity.

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EMERGENCY PHONE NUMBERS:
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(415) 229-3050—Martinez, CA
(713) 944-1924—So. Houston, TX
(414) 258-6970—West Allis, WI

ARGON
MATERIAL
SAFETY
DATA SHEET

PRODUCT NAME	CAS #
Argon	7440-37-1
TRADE NAME AND SYNONYMS	DOT I.D. No.:
Argon; Argon, compressed	UN 1006
CHEMICAL NAME AND SYNONYMS	DOT Hazard Class:
Argon	Nonflammable gas
	Formula:
	Ar
ISSUE DATE AND REVISIONS	Chemical Family:
25 November 1985	Rare gas

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT Argon is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg (ACGIH, 1985-86).

SYMPTOMS OF EXPOSURE

Effects of exposure to high concentrations so as to displace the oxygen in air necessary for life may include any, all, or none of the following:

- o Loss of balance or dizziness
- o Tightness in the frontal area of the forehead
- o Tingling in the tongue, fingertips or toes

(Continued on last page.)

TOXICOLOGICAL PROPERTIES

Argon is nontoxic but the liberation of a large amount in a confined area could displace the amount of oxygen in air necessary to support life.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO ARGON. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

None

PHYSICAL DATA

BOILING POINT -302.6°F (-185.9°C)	LIQUID DENSITY AT BOILING POINT 87 lb/ft^3 (1393 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C): Above the critical temp. of -188.1°F (-122.3°C)	GAS DENSITY AT 70°F, 1 atm .1034 lb/ft^3 (1.656 kg/m^3)
SOLUBILITY IN WATER Very slightly	FREEZING POINT -308.9°F (-189.4°C)
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) 1.38
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMABLE LIMITS % BY VOLUME LEL N/A	UEL N/A
EXTINGUISHING MEDIA Nonflammable, inert gas		ELECTRICAL CLASSIFICATION Nonhazardous	
SPECIAL FIRE FIGHTING PROCEDURES N/A			
UNUSUAL FIRE AND EXPLOSION HAZARDS N/A			

REACTIVITY DATA

STABILITY Unstable		CONDITIONS TO AVOID
Stable	X	N/A
INCOMPATIBILITY (Materials to avoid) None		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur		CONDITIONS TO AVOID
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION See Local Exhaust on last page.	LOCAL EXHAUST See last page.	SPECIAL N/A
	MECHANICAL (Gen.) N/A	OTHER N/A
PROTECTIVE GLOVES Any material		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Argon or Argon, Compressed DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1006

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional recommendations, consult Compressed Gas Association's Pamphlets P-1, P-9, P-14, and Safety Bulletin SB-2.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional recommendations, consult Compressed Gas Association's Pamphlets P-1, P-9, P-14, and Safety Bulletin SB-2.

SPECIAL PACKAGING RECOMMENDATIONS

Argon is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance

SYMPTOMS OF EXPOSURE: (Continued)

- o Weakened speech leading to the inability to utter sounds
- o Rapid reduction in the ability to perform movements
- o Reduced consciousness of the surroundings
- o Loss of tactile sensations
- o Heightened mental activity

It should be recognized that it is possible that none of the above symptoms may occur in argon asphyxia so that there are no definite warning symptoms.

LOCAL EXHAUST: (Continued)

To prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 18 molar percent.

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VALLEY FORGE, PA 19482

EMERGENCY PHONE NUMBERS:
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(415) 229-3050—Martinez, CA
(713) 944-1924—So. Houston, TX
(414) 258-8970—West Allis, WI

25-50% ARGON IN HELIUM

MATERIAL SAFETY DATA SHEET

PRODUCT NAME 25-50% Argon in Helium	CAS * for Argon = 7440-37-1; for Helium = 7440-59-7
TRADE NAME AND SYNONYMS 25-50% Argon in Helium	DOT I.D. No.: UN 1956
CHEMICAL NAME AND SYNONYMS 25-50% Argon in Helium	DOT Hazard Class: Nonflammable gas
ISSUE DATE AND REVISIONS 25 November 1985	Formula: 25-50 Molar % Ar in He
	Chemical Family: Inert gas mixture

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

No TWA is established. The gas mixtures are simple asphyxiants. Oxygen levels should be maintained at greater than 18 molar percent at normal (Continued on last page)

SYMPTOMS OF EXPOSURE

Effects of exposure to high concentrations so as to displace the oxygen in the air necessary for life are headache, dizziness, labored breathing and eventual unconsciousness.

TOXICOLOGICAL PROPERTIES

Mixtures are nontoxic but the liberation of a large amount in a confined area could displace the amount of oxygen in air necessary to support life.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO THESE MIXTURES. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

None

PHYSICAL DATA (SEE NOTE ON LAST PAGE)

BOILING POINT Gas mixture	LIQUID DENSITY AT BOILING POINT Gas mixture
VAPOR PRESSURE Gas mixture	GAS DENSITY AT 70°F, 1 atm Gas mixture
SOLUBILITY IN WATER Gas mixture	FREEZING POINT Gas mixture
EVAPORATION RATE Gas mixture	SPECIFIC GRAVITY (AIR=1) @ 70°F (21.1°C) = less than 0.76
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMAGLE LIMITS % BY VOLUME LEL N/A UEL N/A
EXTINGUISHING MEDIA Nonflammable gas mixture		ELECTRICAL CLASSIFICATION Nonhazardous
SPECIAL FIRE FIGHTING PROCEDURES N/A		
UNUSUAL FIRE AND EXPLOSION HAZARDS N/A		

REACTIVITY DATA

STABILITY Unstable		CONDITIONS TO AVOID
Stable	X	N/A
INCOMPATIBILITY (Materials to avoid) None		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur		CONDITIONS TO AVOID
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION See Local Exhaust on last page.	LOCAL EXHAUST See last page.	SPECIAL N/A
	MECHANICAL (Gen.) N/A	OTHER N/A
PROTECTIVE GLOVES As required when welding		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes and appropriate head and eye protection when welding		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Compressed gas, n.o.s. DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1956

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-1, P-9, and P-14 and Safety Bulletin SB-2.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, P-9, and P-14 and Safety Bulletin SB-2.

SPECIAL PACKAGING RECOMMENDATIONS

These gas mixtures are noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HEALTH HAZARD DATA (Continued)

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg (ACGIH, 1985-86).

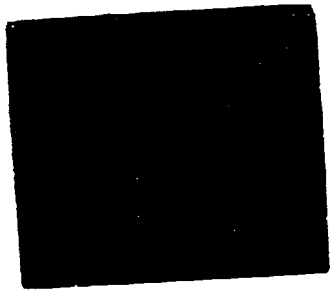
PHYSICAL DATA (Continued)

NOTE: For physical data of the pure gases, see your supplier's material safety data sheets for argon and helium.

SPECIAL PROTECTION INFORMATION (Continued)

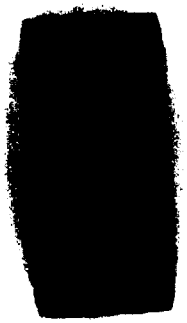
LOCAL EXHAUST: (Continued)

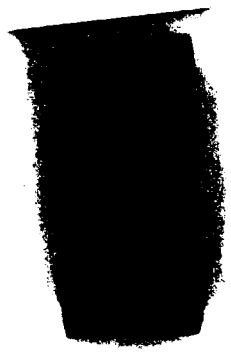
To prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 18 molar percent.



Mogul 9165A

Mogul

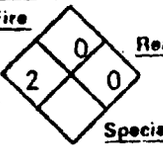




MOGUL
DIVISION OF THE DEXTER CORPORATION
Chagrin Falls, Ohio 44022
(216) 247-5000

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT
* = CHRONIC HEALTH HAZARD - SEE SECTION V



Mogul 9/20/84

MATERIAL SAFETY DATA SHEET

SECTION I

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Hydrolyzed polyacrylamide	MOGUL 9165A
CHEMICAL FAMILY	**FORMULA**
Industrial Water Treatment	Proprietary

SECTION II – HAZARDOUS INGREDIENTS

MATERIAL	CAS #	%	TLV (units)
Acrylamide	79-06-1	<1.	0.3 mg/M^3 (skin)

SECTION III – PHYSICAL DATA

BOILING POINT (°F)	NA	SPECIFIC GRAVITY (H_2O=1)	1.05
VAPOR PRESSURE (mm Hg.)	NA	PERCENT, VOLATILE BY VOLUME (%)	NA
VAPOR DENSITY (AIR = 1)	NA	EVAPORATION RATE (_____ = 1)	NA
SOLUBILITY IN WATER	complete	pH	NA

APPEARANCE AND ODOR: White viscous liquid; slightly sweet odor

SECTION IV – FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method Used)	FLAMMABLE LIMITS	Lel	Uel
212°F (DIN 51367)	NA		

EXTINGUISHING MEDIA: Water

SPECIAL FIRE FIGHTING PROCEDURES: Keep drums, exposed to fire, cool with water.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

SECTION V – HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: Acrylamide - 0.3 mg/M^3 (skin)

EFFECTS OF OVEREXPOSURE: Contains low levels of acrylamide monomer, a suspect carcinogen. Avoid contact with eyes, skin, and mucous membranes. May irritate or damage eyes, skin and mucous membranes.

EMERGENCY AND FIRST AID PROCEDURES: SKIN: Flush with water, then wash thoroughly with soap and water. EYES: Flush with water for 15 minutes and get medical attention if an irritation persists. INGESTION: Drink plenty of water, and call collect (412) 681-6669, or consult physician immediately. Avoid alcoholic beverages.

FOR MEDICAL EMERGENCY CALL COLLECT (412) 681-6669

(continued on reverse side)

The Mogul Corporation

SECTION VI – REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	None

INCOMPATABILITY (Materials to avoid)

None

HAZARDOUS DECOMPOSITION PRODUCTS

None

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	None

SECTION VII – SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

If material contacts water on floor, slippery condition will result. Absorb with sawdust or other absorbent. When dry, sweep up.

WASTE DISPOSAL METHOD

Not a RCRA hazardous waste. Incinerate or bury in accordance with local, state, and federal requirements.

SECTION VIII – SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

None

VENTILATION	LOCAL EXHAUST: NA	SPECIAL: NA
	MECHANICAL (General): NA	OTHER: NA

PROTECTIVE GLOVES: Rubber	EYE PROTECTION: Chemical safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT

None

SECTION IX – SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Material should be stored in a dry location; not over 40°C. Do not expose to freezing temperatures. Before use, stir until homogeneous.

OTHER PRECAUTIONS

Keep container closed when not in use. Wash thoroughly after handling.

FOR MEDICAL EMERGENCY CALL COLLECT (412) 681-6669

TOTAL WATER MOGUL MANAGEMENT

THE MOGUL CORPORATION

WATER TREATMENT PRODUCTS AND SERVICES SINCE 1915

P. O. BOX 200 • CHAGRIN FALLS, OHIO 44022 • (216) 247-5000 • TELEX NUMBER 985-626

Copied for Z. Ottofy File (BD) 10-17-83

cc J. SUNDSTROM 10-26-83

October 3, 1983

Cerro Copper Products
Hwy #3 Alton & Southern Tracks
Sauget, IL 62201

Dear Mogul Polymer Customer:

Current day technology and the resulting increase in scientific information impacts us all daily. With increasingly improved technologies, we are discovering more about the use of chemicals, including the possible hazards in handling them.

Mogul is proud of our policy of keeping you informed of current scientific developments which impact our products, so that you can use them properly and safely. This letter is to inform you of some new information we have relative to the use of polymers which may contain residual acrylamide monomer.

TEST RESULTS

The Dow Chemical Company, a leading manufacturer of polyacrylamides, has reported to the EPA, FDA, Dow employees, and Dow customers, the results of a two year rat toxicity study. Preliminary results indicate that there was an increased incidence of neoplasms to the mammary glands, brain and spinal cord, clitoral gland, uterus, oral cavity, and pituatory and thyroid glands. A copy of the Dow Chemical August 8, 1983 letter is attached. Please read it and refer this information to those in your company responsible for such matters. The recommendations made by Dow should be followed as appropriate.

PRODUCT SAFETY/HANDLING

Our records indicate that you may be using 9165A, a polymer product, which may contain less than one percent acrylamide monomer. We have enclosed a Material Safety Data Sheet for this product for specific safety and handling information.

Thank you for your continued confidence in Mogul products and services.

Sincerely,

D. L. Wilbur

D. L. Wilbur
Manager - Regulatory Affairs

Encls.

DOW CHEMICAL U.S.A.

P. O. BOX 1847
2040 DOW CENTER
MIDLAND, MICHIGAN 48640

August 8, 1983

Dear Polyacrylamide Customer:

Introduction

During July 1983, Dow reported the preliminary results of a two-year toxicity and oncogenicity (tumor) study of acrylamide monomer in rats to the Environmental Protection Agency, to the Food and Drug Administration, to Dow employees, and to Dow aqueous acrylamide monomer customers. Because Dow produced acrylamide polymers contain a small residual of the monomer, the results of this toxicological study are reviewed and recommendations for reducing exposure are offered.

Results

This study is being conducted in Dow's Toxicology Research Laboratory. The dose levels used in this two-year drinking water study were 0, 0.01, 0.1, 0.5, and 2.0 milligrams of acrylamide monomer per kilogram of body weight per day. The microscopic examination of the tissues of the female rats has just been completed. The preliminary results from that portion of the study indicate that at the highest dose level, there is a statistically significant increase in the incidence of mammary neoplasms. Degenerative effects on peripheral nerves were also found at this dose level. In addition and only at the highest dose level, neoplasms were statistically significantly increased in the central nervous system (brain and spinal cord), clitoral gland, uterus, oral cavity, pituitary and thyroid gland. Final conclusions will be reported following completion of the remaining portions of this study.

Recommendations

At this time we are not suggesting changes in the industrial hygiene exposure guidelines for Dow produced acrylamide monomer or polymer. Exposure control practices should be reviewed to assure that exposures to the Dow monomer and polymer are adequately controlled. The current ACGIH TLV for acrylamide monomer is 0.3 milligrams per cubic meter - skin (0.6 milligrams per cubic meter short-term exposure limit). Dow has recommended exposures to acrylamide polymers be controlled below

Encls.

ten (10) milligrams per cubic meter as dust. It is especially important to recognize the skin as a significant potential route of acrylamide monomer entry into the body. It is possible for the residual acrylamide monomer contained in polymer to enter the body both via inhalation and skin contact with polymer. The current TLV for monomer was set with the previous knowledge that changes in the peripheral nervous system were possible in animals at the highest dose level used in this study.

We want to emphasize the safe handling recommendations that have been previously suggested in the use of Dow acrylamide polymers. We recommend that protective clothing be utilized as appropriate to minimize skin exposure to solid polymers or polymer solutions, and that the clothing be washed daily prior to reuse. Contaminated skin must be cleansed. Consideration should be given to the use of showers at the end of the work day or following gross contamination as is appropriate for the specific work environment. Respiratory protection (dust masks) should be considered for use when performing specific tasks where there is potential for inhalation exposure of polymer dusts. It is also recommended that control of dusts and employee education on personal hygiene, skin exposure potential, and the proper use of respiratory protection and protective clothing be reviewed as is appropriate for the specific work environment.

We will continue to review the results of the ongoing toxicological study and the adequacy of the current exposure guides will continue to be assessed in light of these interim findings and the final results from this study.

Questions concerning any of the above information should be directed to:

W. H. (Werner) Braun, 517-636-6151

Sincerely,

F. P. Frauson, Jr.
Product Sales Manager
Designed Products Department

FPF/rkb

MOBIL SHC 600

Mobil

Mobil SHC 600

#3 BLOCK
GEAR BOX

Synthetic

Mobil Product Data Sheet

Mobil SHC® 600 Series

Gear and Bearing Lubricants

Product Description

Mobil SHC 600 series gear and bearing lubricants are formulated using Mobil's synthesized hydrocarbon fluid (SHF) technology and additives that enhance oxidation stability, and provide protection against rust, corrosion and wear. The SHFs provide much better thermal and oxidation stability than conventional mineral oils. The Mobil SHC 600 oils have naturally high viscosity indexes over 130 and, therefore, when compared to mineral oils of the same viscosity grades, they provide lower viscosity at lower temperatures and higher viscosity at higher temperatures. The SHFs also insure that there is no loss of viscosity as a result of mechanical shearing in service, even in heavily loaded gear applications.

The low traction coefficient and naturally high viscosity index of the Mobil SHC 600 oils combine to reduce power consumption substantially. Lower operating temperatures of component parts mean that friction has been reduced and, therefore, less power is consumed. This results in extended parts life and allows for more economical equipment design considerations and extended lubricant life.

Application

Mobil SHC 600 series lubricants are recommended for industrial gears and bearings where high operating temperatures result in frequent short oil life or high maintenance costs for parts replacement, system cleaning, and lubricant changes.

The wax-free, synthesized base stock, combined with the naturally high viscosity index of these lubricants, provide outstanding lubrication of gears and bearings in severe low-temperature applications.

The Mobil SHC 600 oils are compatible with the following seal materials: fluorocarbon, polyacrylate, polyurethane ether, silicone, ethylene/acrylic, chlorinated polyethylene, polysulfide, and Buna N.

When changing to one of the Mobil SHC 600 series lubricants, the system should be cleaned and flushed thoroughly to achieve the maximum performance benefits of the products.

Typical Characteristics

The physical characteristics of the Mobil SHC 600 series lubricants are shown in the data sheet table. Those values not shown as maximum or minimum are typical and may vary slightly.

Health and Safety

Based on available toxicological information, when properly handled and used, these products have little or no adverse health effects. No special precautions

Characteristic Product No.	Mobil SHC 624 60292-0	Mobil SHC 626 60293-8	Mobil SHC 629 60294-6	Mobil SHC 630 60295-3	Mobil SHC 632 60298-7	Mobil SHC 634 60291-2	Mobil SHC 636 60299-5	Mobil SHC 639 60290-4
ISO Viscosity Grade	32	68	150	220	320	460	680	1000
Gravity, API	35.3	33.5	32.2	31.4	30.9	28.5	27.5	31.8
Pour Point, °F (°C), max.	– 55 (– 48.3)	– 55 (– 48.3)	– 40 (– 40)	– 40 (– 40)	– 30 (– 34.4)	– 20 (– 28.8)	– 20 (– 28.8)	– 15 (– 26.1)
Flash Point, °F (°C), min.	425 (218.3)	425 (218.3)	445 (229.4)	445 (229.4)	445 (229.4)	445 (229.4)	445 (229.4)	445 (229.4)
Viscosity								
cSt @ 40°C	30.7	65.2	141	217	298	430	650	956
cSt @ 100°C	5.8	10.4	18.6	25.9	33	44.5	62.1	77.6
Viscosity Index, min.	130	140	145	145	150	155	160	160
Copper Corrosion ASTM D130				1B				
Rust Test ASTM D665A				Pass				
FZG Spur Gear Test, Fail Stage	9	11	12+	12+	12+	12+	12+	12+
Color, ASTM, max.	1.0	1.0	1.0	1.0	1.0	1.0	1.0	3.0

[redacted]

MOBIL MOBILMET 104

MOBIL OIL

[redacted]

[redacted]

Mobil Material Safety Data Bulletin

MOBILMET 104

ISSUED BY
DEPARTMENT OF ENVIRONMENTAL AFFAIRS AND TOXICOLOGY
PRODUCT SAFETY AND COMPLIANCE
MOBIL OIL CORPORATION
150 EAST 42ND STREET
NEW YORK, NEW YORK 10017

********** PRODUCT IDENTIFICATION **********

MOBILMET 104

MANUFACTURER:
MOBIL OIL CORP.

EMERGENCY TELEPHONE:
(212)883-4242

CHEMICAL NAMES AND SYNONYMS:
PET. HYDROCARBON AND ADDITIVES

OTHER DESIGNATION:
(TRN 660100)

USE OR DESCRIPTION:
METAL PROCESSING FLUID

DESCRIPTIVE FORMULA:
SEE INGREDIENTS BELOW

********** TYPICAL CHEMICAL AND PHYSICAL PROPERTIES **********

APPEARANCE:
ASTM 3.5 LIQUID

VISCOSITY: AT 100 F, SUS
265.0

AT 40 C, CS
51.0

ODOR:
MILD

VISCOSITY: AT 210 F, SUS
N/E

AT 100 C, CS
N/E

RELATIVE DENSITY: 15/4 C
0.935

SOLUBILITY IN WATER:
APPRECIABLE

PH:
N/A

MELTING POINT: F(C)
N/A

POUR POINT: F(C)
-65(-54)

BOILING POINT: F(C)
>600(316)

FLASH: F(C)
330(166)

VAPOR PRESSURE: MM HG 20C
< .1

********** INGREDIENTS **********

	WT PCT	TLV(NOTES):	MG/M3	PPM
HAZARDOUS INGREDIENTS:				
NONE				
NON-HAZARDOUS INGREDIENTS:				
REFINED MINERAL OILS	> 80			
ADDITIVES	< 20			
WATER	< 5			

********** FIRE AND EXPLOSION HAZARD DATA **********

FLASH POINT: F(C) (METHOD) | FLAMMABLE LIMITS: LEL | UEL
330(165) (ASTM D92) | N/E | N/E

EXTINGUISHING MEDIA:
CO2, FOAM, DRY CHEMICAL

SPECIAL FIRE FIGHTING PROCEDURES:
FIREFIGHTERS MUST USE SELF-CONTAINED BREATHING APPARATUS.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
NONE

********** HEALTH HAZARD DATA **********

THRESHOLD LIMIT VALUE: (NOT REQUIRED FOR MIXTURES)

EFFECTS OF OVEREXPOSURE:
MODERATE EYE IRRITATION. SLIGHT SKIN IRRITATION.

********** EMERGENCY AND FIRST AID PROCEDURES **********

EYE CONTACT:
FLUSH THOROUGHLY WITH WATER FOR AT LEAST 15 MINUTES. GET MEDICAL ASSISTANCE.

SKIN CONTACT:
WASH CONTACT AREAS WITH SOAP AND WATER.

INHALATION:
REMOVE FROM FURTHER EXPOSURE. IF UNCONSCIOUSNESS OCCURS, SEEK IMMEDIATE MEDICAL ASSISTANCE AND CALL A PHYSICIAN. IF BREATHING HAS STOPPED, USE MOUTH TO MOUTH RESUSCITATION.

INGESTION:
IF LARGE QUANTITIES ARE INGESTED (~ONE PINT (1/2 LITER) FOR AN ADULT OR PROPORTIONATELY LESS FOR A CHILD), INDUCE VOMITING BY GIVING TWO GLASSES OF WATER AND STICKING FINGERS DOWN THROAT. CALL A PHYSICIAN. DO NOT INDUCE VOMITING OR GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.

********** REACTIVITY DATA **********

STABILITY: (THERMAL, LIGHT, ETC.) | CONDITIONS TO AVOID:
STABLE | STRONG OXIDATION

INCOMPATIBILITY: (MATERIALS TO AVOID)
STRONG OXIDIZERS

HAZARDOUS DECOMPOSITION PRODUCTS:
CO AND CO2.

HAZARDOUS POLYMERIZATION: | CONDITIONS TO AVOID:
WILL NOT OCCUR

********** TOXICOLOGICAL DATA **********

ACUTE

ORAL TOXICITY: (RATS)
LD50: > 5 G/KG SLIGHTLY TOXIC(ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

DERMAL TOXICITY: (RABBITS)
LD50: > 2 G/KG SLIGHTLY TOXIC(ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

INHALATION TOXICITY: (RATS)
SLIGHTLY TOXIC(ESTIMATED) ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

EYE IRRITATION: (RABBITS)
EXPECTED TO CAUSE IRRITATION. ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

SKIN IRRITATION: (RABBITS)
EXPECTED TO CAUSE SLIGHT IRRITATION ON PROLONGED OR REPEATED CONTACT. ---BASED ON TESTING OF SIMILAR PRODUCTS AND/OR THE COMPONENTS.

SUBACUTE AND MUTAGENICITY (SUMMARY)

CHRONIC OR SPECIALIZED (SUMMARY)

OTHER DATA

FILE CODES: (MOBIL USE ONLY)
NONE

PREPARED BY: Andrew E. Bertone

DATE: JUN 1 0 1981

ENVIRONMENTAL IMPACT:
REPORT SPILLS AS REQUIRED TO APPROPRIATE AUTHORITIES. U. S. COAST GUARD REGULATIONS REQUIRE IMMEDIATE REPORTING OF SPILLS THAT COULD REACH ANY WATERWAY INCLUDING INTERMITTENT DRY CREEKS. REPORT SPILL TO COAST GUARD TOLL FREE NUMBER 800-424-8802.

PROCEDURES IF MATERIAL IS RELEASED OR SPILLED:
ADSORB ON FIRE RETARDANT TREATED SAWDUST, DIATOMACEOUS EARTH, OR OTHER ADSORBENT. SHOVEL UP AND DISPOSE OF IN APPROVED HAZARDOUS WASTE DISPOSAL FACILITY.

WASTE DISPOSAL METHODS:
DISSOLVE WASTE IN A FLAMMABLE SOLVENT AND DISPOSE BY SUPERVISED INCINERATION IN COMPLIANCE WITH LOCAL REGULATIONS.

********** SPECIAL PROTECTION INFORMATION **********
EYE PROTECTION:
CHEMICAL TYPE GOGGLES SHOULD BE WORN.

SKIN PROTECTION:
NO SPECIAL EQUIPMENT REQUIRED. HOWEVER, GOOD PERSONAL HYGIENE PRACTICES SHOULD ALWAYS BE FOLLOWED.

RESPIRATORY PROTECTION:
NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.

VENTILATION:
NO SPECIAL REQUIREMENTS UNDER ORDINARY CONDITIONS OF USE AND WITH ADEQUATE VENTILATION.

OTHER:

********** SPECIAL PRECAUTIONS **********
HANDLING AND STORING:
HANDLING: AVOID CONTACT WITH EYES.

MOBILMET 100 copy B. attached 7-20-81

Mobil Oil Corporation

ENVIRONMENTAL AFFAIRS
AND TOXICOLOGY DEPARTMENT

150 EAST 42ND STREET
NEW YORK, NEW YORK 10017

(212) 883-5586

July 13, 1981

Cerro Copper Products Co.
P. O. Box 681
East St. Louis, IL 62202

Att: Mr. Dave Durham

Dear Mr. Durham:

Thank you for your recent correspondence requesting safety information on the product listed below. The enclosed MOBIL MATERIAL SAFETY DATA BULLETIN has been prepared in a format which is "essentially similar" to form OSHA 20.

Should you require any further information on the safe handling of this or any other Mobil products, please do not hesitate to contact us.

Sincerely,

Andrew E. Bertone

A. E. Bertone
Product Safety & Compliance

Mobilmet 100 Series

AEB/pd
Enclosure

cc: A. F. Coopland

[redacted]

2-5% HYDROGEN & ARGON

Amerigas

[redacted]

[redacted]

AmeriGas
INDUSTRIAL GASES DIVISION
P.O. BOX 965
VALLEY FORGE, PA 19482

EMERGENCY PHONE NUMBERS:
(215) 337-8900—Valley Forge, PA
(415) 229-3050—Martinez, CA
(713) 944-1924—So. Houston, TX
(414) 258-6970—West Allis, WI

2-5% HYDROGEN IN ARGON
MATERIAL SAFETY DATA SHEET

PRODUCT NAME 2-5% Hydrogen in Argon	CAS # For Hydrogen = 1333-74-0; For Argon = 7440-37-1
TRADE NAME AND SYNONYMS 2-5% Hydrogen in Argon	DOT I.D. No.: UN 1956
CHEMICAL NAME AND SYNONYMS 2-5% Hydrogen in Argon	DOT Hazard Class: Nonflammable gas
ISSUE DATE AND REVISIONS 25 November 1985	Formula: 2-5 Molar % H_2 in Ar
	Chemical Family: Gas mixture

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

No TWA is established. The gas mixture is a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal (Continued on last page)

SYMPTOMS OF EXPOSURE

Effects of exposure to high concentrations so as to displace the oxygen in the air necessary for life are headache, dizziness, labored breathing and eventual unconsciousness.

TOXICOLOGICAL PROPERTIES

Mixture is nontoxic, but the liberation of a large amount in a confined area could displace the amount of oxygen in air necessary to support life.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO THESE MIXTURES. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

None

PHYSICAL DATA (SEE NOTE ON LAST PAGE)

BOILING POINT Gas mixture	LIQUID DENSITY AT BOILING POINT Gas mixture
VAPOR PRESSURE Gas mixture	GAS DENSITY AT 70°F, 1 atm Gas mixture
SOLUBILITY IN WATER Gas mixture	FREEZING POINT Gas mixture
EVAPORATION RATE Gas mixture	SPECIFIC GRAVITY (AIR=1) @ 70°F (21.1°C) = Greater than 1.3

APPEARANCE AND ODOR
Colorless, odorless gas

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMAGLE LIMITS % BY VOLUME LEL N/A UEL N/A
EXTINGUISHING MEDIA N/A		ELECTRICAL CLASSIFICATION Nonhazardous

SPECIAL FIRE FIGHTING PROCEDURES

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

N/A

REACTIVITY DATA

STABILITY Unstable		CONDITIONS TO AVOID
Stable	X	N/A

INCOMPATIBILITY (Materials to avoid)
None

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION May Occur		CONDITIONS TO AVOID
Will Not Occur	X	N/A

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
See Local Exhaust	(See last page)	N/A
	MECHANICAL (Gen.)	OTHER
	N/A	N/A

PROTECTIVE GLOVES
As required

EYE PROTECTION
Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT
Safety shoes

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION
DOT Shipping Name: Compressed gas, n.o.s. DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1956

SPECIAL HANDLING RECOMMENDATIONS
Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-1, P-14 and Safety Bulletin SB-2.

SPECIAL STORAGE RECOMMENDATIONS
Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, P-14 and Safety Bulletin SB-2.

SPECIAL PACKAGING RECOMMENDATIONS
These gas mixtures are noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS
Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HEALTH HAZARD DATA (Continued)

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg (ACGIH, 1985-86)..

PHYSICAL DATA (Continued)

NOTE: For physical data of the pure gases, see your supplier's material safety data sheets for hydrogen and argon.

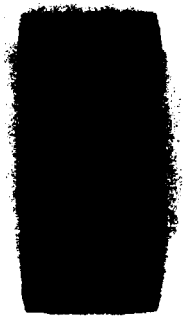
SPECIAL PRECAUTIONS (Continued)

LOCAL EXHAUST: (Continued)

To prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 18 molar percent.

HOUGHTO SAFE 5046

E. F. HOUGHTON CO.



U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

HOUGHTO SAFE 5046

MATERIAL SAFETY DATA SHEET

RE-ISSUE 8-10-77

(55)

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
E. F. HOUGHTON & COMPANY	215-RE-9-7100

ADDRESS (Number, Street, City, State, and ZIP Code)
303 W. Lehigh Avenue, Philadelphia, Pa. 19133

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
	HOUGHTO SAFE 5046
CHEMICAL FAMILY	FORMULA
	Emulsion of Water (38%) in Oil

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
Ethylene Glycol LD_{50} 7.4 ml/kg (Rats)	5	
Morpholine-Air -TWA-skin 20 ppm	0.3	

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	212	SPECIFIC GRAVITY (H_2O=1)	0.953
VAPOR PRESSURE (mm Hg.)	As Water	PERCENT, VOLATILE BY VOLUME (%) (Water)	38
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____ =1)	
SOLUBILITY IN WATER	Emulsifies		

APPEARANCE AND ODOR Pale yellow emulsion, very bland odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
None as received. Contains 38% water			

EXTINGUISHING MEDIA CO_2, Foam, Dry Chemical

SPECIAL FIRE FIGHTING PROCEDURES Fire resistant hydraulic fluid

UNUSUAL FIRE AND EXPLOSION HAZARDS

(Continued on reverse side)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: N/A

EFFECTS OF OVEREXPOSURE: None known.

EMERGENCY AND FIRST AID PROCEDURES
Eyes-Flush with water for 15 minutes, consult physician.
Skin-Wash with soap and water. Ingestion- consult physician.

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS
Thermal decomposition-CO_2 and/or CO

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Dilute with water, mop up.

WASTE DISPOSAL METHOD
Split the emulsion with acid or acid salt, skim off oil and dispose as required by regulations for waste petroleum oil.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*: Not required

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES

EYE PROTECTION: Goggles recommended

OTHER PROTECTIVE EQUIPMENT: Not required.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Avoid freezing or prolonged storage.
Avoid contact with strong oxidizers. C

OTHER PRECAUTIONS

[redacted]

HELIUM

Amerigas

[redacted]

[redacted]

AmeriGas
INDUSTRIAL GASES DIVISION
P.O. BOX 965
VALLEY FORGE, PA 19482

EMERGENCY PHONE NUMBERS:
(215) 337-8900—Valley Forge, PA
(415) 229-3050—Martinez, CA
(713) 944-1924—So. Houston, TX
(414) 258-8970—West Allis, WI

HELIUM

MATERIAL SAFETY DATA SHEET

PRODUCT NAME	CAS #
Helium	7440-59-7
TRADE NAME AND SYNONYMS	DOT I.D. No.:
Helium	UN 1046
CHEMICAL NAME AND SYNONYMS	DOT Hazard Class:
Helium	Nonflammable gas
	Formula:
	He
ISSUE DATE AND REVISIONS	Chemical Family:
25 November 1985	Inert gas

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

Helium is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric pressure which is equivalent to a partial pressure of 135 mm Hg (ACGIH, 1985-86).

SYMPTOMS OF EXPOSURE

Effects of exposure to high concentrations so as to displace the oxygen in the air necessary for life are headache, dizziness, labored breathing and eventual unconsciousness. Breathing mixtures of helium with adequate oxygen to support life modifies the voice sound so that it is higher "pitched."

TOXICOLOGICAL PROPERTIES

Helium is nontoxic but the liberation of a large amount in a confined area could displace the amount of oxygen in air necessary to support life.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO HELIUM. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

None

PHYSICAL DATA

BOILING POINT -452.1°F (-268.9°C)	LIQUID DENSITY AT BOILING POINT 7.8 lb/ft^3 (125 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C) Above the critical temp. of -450.3°F (-268°C)	GAS DENSITY AT 70°F, 1 atm .0103 lb/ft^3 (.1650 kg/m^3)
SOLUBILITY IN WATER Negligible	FREEZING POINT Triple point = -456.5°F (-271.3°C)
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) = 70°F (21.1°C) = .138
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMAGLE LIMITS % BY VOLUME LEL N/A UEL N/A
EXTINGUISHING MEDIA Nonflammable, inert gas		ELECTRICAL CLASSIFICATION Nonhazardous
SPECIAL FIRE FIGHTING PROCEDURES N/A		
UNUSUAL FIRE AND EXPLOSION HAZARDS N/A		

REACTIVITY DATA

STABILITY Unstable		CONDITIONS TO AVOID N/A
Stable	X	
INCOMPATIBILITY (Materials to avoid) None		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur		CONDITIONS TO AVOID N/A
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION See Local Exhaust on last page.	LOCAL EXHAUST See last page.	SPECIAL N/A
	MECHANICAL (Gen.) N/A	OTHER N/A
PROTECTIVE GLOVES Any material		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Helium or Helium, Compressed DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1046

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-1, P-9, P-14 and Safety Bulletin SB-2.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, P-9, P-14 and Safety Bulletin SB-2.

SPECIAL PACKAGING RECOMMENDATIONS

Helium is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance

LOCAL EXHAUST: (Continued)

To prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 18 molar percent.

[redacted]

COPPER, OXYGEN FREE (OFHC)

AMAX MINERALS & ENERGY

[redacted]

[redacted]

(Copper, Oxygen Free (OFHC))

AMAX Minerals+Energy

MATERIAL SAFETY DATA SHEET

OFHC®
(Oxygen Free Copper)

PRODUCT IDENTITY	EMERGENCY CONTACT
CHEMICAL NAME: Copper TRADE NAME: Oxygen Free Copper (OFHC®) FORMULA: Cu CAS NO.: 7440-50-8 PHYSICAL FORM: Billet or Sheet	CORPORATE MANAGER OF INDUSTRIAL HYGIENE AMAX INC. AMAX CENTER GREENWICH, CONNECTICUT 06836 TELEPHONE NO.: (203) 629-7112

COMPOSITION

MATERIAL	CAS NO.	%	PERMISSIBLE AIR LEVEL
Copper	7440-50-8	100	OSHA: fume - 0.1 mg/m^3 dust - 1.0 mg/m^3 ACGIH: fume - 0.2 mg/m^3 dust - 1.0 mg/m^3

HEALTH HAZARD INFORMATION

OSHA PERMISSIBLE EXPOSURE LEVEL: fume: 0.1 mg/m^3; dust - 1.0 mg/m^3
ACGIH THRESHOLD LIMIT VALUE: fume: 0.2 mg/m^3; 1.0 mg/m^3

PRIMARY ROUTE OF ENTRY: Inhalation of dust or fumes.

SYMPTOMS AND EFFECTS OF: NOTE: This material is sold in a solid form, and as such is not a health hazard, however, dust and fumes that result from the processing of this material are hazardous.

ACUTE OVEREXPOSURE: Copper fumes or dust may cause irritation of the eyes, nose and throat, and a flu-like illness called Metal Fume Fever. Symptoms of Metal Fume Fever include: fever, muscle aches, nausea, chills, dry throat, cough and weakness. It may also leave a metallic or sweet taste in the mouth.

CHRONIC OVEREXPOSURE: Repeated or long term exposures to copper dust or fumes may cause skin irritation or discoloration of the skin or hair.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY THIS MATERIAL: Chronic respiratory disease, skin disease and Wilson's disease. Animal studies have indicated that copper can cause liver, kidney and hematopoletic damage.

IS THIS MATERIAL CONSIDERED TO BE CARCINOGENIC BY:
NTP? No IARC? No OSHA? No

EMERGENCY AND FIRST AID PROCEDURES

If a person breathes in a large amount of dust or fumes, remove from exposure; if breathing has stopped, perform artificial respiration. Call a physician.

If irritation of the eyes, nose, throat or skin occur, remove from exposure, flush eyes with large amounts of water and call a physician. Wash skin with mild soap and water.

EXPOSURE CONTROL MEASURES

ENGINEERING: Use ventilation to maintain exposure levels within the OSHA limits.

PERSONAL PROTECTIVE EQUIPMENT: Use a NIOSH/MSHA approved respirator if exposure to dust or fumes exceeds the OSHA limits. Wear eye protection when handling or processing this material.

REACTIVITY DATA

STABILITY: This material is stable.

INCOMPATABILITY: Copper reacts violently with C_2H_2, NH_4NO_3, bromates, chlorates, iodates, Cl_2, ClF_2, (Cl_2 & OF_2), ethylene oxide, F_2, H_2O_2, hydrozine mononitrate, hydrozoic acid, H_2S, $Pb(N_3)_2$, K_2O_2, NaN_3, Na_2O_2.

HAZARDOUS DECOMPOSITION PRODUCTS: Copper fumes when heated.

HAZARDOUS POLYMERIZATION: Will not occur.

FIRE and EXPLOSION HAZARD DATA

FLASH POINT: Not applicable. FLAMMABLE LIMITS: LEL * UEL *

EXTINGUISHING MEDIA: Dry chemical or sand.

SPECIAL FIRE FIGHTING PROCEDURES: Wear protective fire fighting clothing and self-contained breathing equipment.

UNUSUAL FIRE AND EXPLOSION HAZARDS: See "Reactivity Data" above.

* Do not apply

PRECAUTIONS FOR SAFE HANDLING AND USE

PRECAUTIONS FOR HANDLING AND STORAGE: None necessary.

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED: Clean up dust by vacuuming to minimize exposure. Provide employees with respirators for dusty conditions.

WASTE DISPOSAL METHODS: Dispose of in accordance with federal, state and local laws and regulations.

NOTE: THIS MATERIAL WAS REPORTED ON THE INITIAL TSCA INVENTORY.

PHYSICAL/CHEMICAL CHARACTERISTICS

MELTING POINT: 1083°C SPECIFIC GRAVITY (H_2O=1): 8.9

VAPOR PRESSURE @ 20°C: essentially 0 SOLUBILITY IN WATER: Insoluble

APPEARANCE AND ODOR: Red or bronze colored metal sheet or billet.

DATE PREPARED: January 2, 1986 DATE REVISED: _____

ASKO PRODUCTS

[redacted]

PURCHASED

ASKO, INC.

[redacted]

ASKO, INC.

~~Askomet Carbide Grades~~

Asko Products

~~Askodyne H~~

~~Unishear 1100~~

~~Unishear 2200~~

[redacted]

MATERIAL SAFETY DATA SHEET

Asko Products

ASKO, Inc.

501 West Seventh Avenue
West Homestead, PA 15120
Telephone Number:
(412) 461-4110

CHEMICAL NAME: N/A

TRADE NAME AND SYNONYMS:

This Material Safety Data Sheet applies to all ASKO products except: ASKODYNE "H"™, UNISHEAR 1100™, UNISHEAR 2200™, and products manufactured under the ASKOMET™ tradename.

CHEMICAL FAMILY: Tool Steel/Alloy Steel Molecular Weight: N/A

PHYSICAL DATA

Appearance and Odor: Gray Metal/no odor
Boiling Point: N/A
Vapor Pressure (mm Hg): N/A
Vapor Density (Air=1): N/A
Solubility in H_2O: Insoluble
Specific Gravity (H_2O=1): N/A
Percentage Volatile by Volume: N/A
Evaporation rate (=1): N/A
How Best Monitored: Air Sample

HAZARDOUS INGREDIENTS

Material	OSHA PEL (Unit)	ACGIH TLV (Unit)
Iron	5mg/M3	5mg/M3
Tungsten	—	5mg/M3
Cobalt	0.1mg/M3	0.1mg/M3
Chromium	1mg/M3 (metal)	0.5mg/M3 (metal)
Nickel	1mg/M3 (metal)	1mg/M3 (metal)
Manganese	5mg/M3	5mg/M3
Molybdenum	15mg/M3	10mg/M3
Vanadium	—	—
Carbon	—	—
Silicon	—	—

Not on list - - -

HEALTH HAZARD DATA

Routes of Exposure:

When used for their intended purpose, Asko products manufactured from material referred to in this MSDS will not result in exposure to hazardous ingredients. Exposure to hazardous ingredients may occur if the alloy product is ground with inadequate local exhaust ventilation or subjected to improper grinding operations such as dry grinding both of which generate respirable dust.

Effects of Overexposure:

Acute Effects: Adverse health effects are not expected to occur after acute exposure to metallic dusts. However, relatively short-term exposures (less than 1 year) to metal dusts have been associated with chronic lung disease.

Chronic Effects: Adverse health effects, including nose and throat irritation and transient or permanent respiratory disease, have been observed after exposure to dusts encountered in the grinding and cutting of metal alloys. Since these alloys contain many different metals it has not been possible to say with absolute certainty which metal(s) is the offending agent, though Cobalt is one of the leading candidates. This particular product may also contain nickel and chromium, which have been associated with health effects noted below. Excessive exposure to dust caused by grinding or cutting this product may cause: 1) Dermatitis—especially in individuals sensitive to cobalt, chrome, or nickel; and 2) Lung damage. Pulmonary fibrosis has been seen in workers with excessive exposures to metal dusts. Chromium and nickel compounds have been associated with irritation, ulceration, and cancer in the respiratory system, though it is not known if metallic dusts of these elements can cause such effects. Manganese (generally over 2 years exposure) can cause damage to the central nervous system, but considering the present amount of manganese this is an unlikely effect.

Health Monitoring: Early recognition of the signs of lung disease from metal dust is important, since this is a progressive disease—but one which may be arrested if caught quickly and exposure is stopped. Further, workers exposed to such dusts are encouraged to not smoke cigarettes, as this habit tends to enhance many types of adverse lung effects.

Emergency and First Aid Procedures: Applicable dusts or mists.

Inhalation: If symptoms of pulmonary involvement develop (coughing, wheezing, shortness of breath, etc.) remove from exposure and seek medical attention.

Skin Contact: If irritation or rash occurs, thoroughly wash affected area with soap and water and isolate from exposure. If irritation or rash persists, seek medical attention.

Eye Contact: If irritation occurs, flush with copious amounts of water. If irritation persists, seek medical attention.

Ingestion: If substantial quantities are swallowed, dilute with a large amount of water. Induce vomiting and seek medical attention.

Carcenogenic Assessment: Nickel and chromium have been identified as known or suspected carcinogens by NTP, IARC or OSHA.

[redacted]

ACETONE

INDEPENDENT PETROCHEMICAL

[redacted]

[redacted]

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

ACETONE

(42)

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
Independent Petrochemical Corporation	(713) 923-1651
ADDRESS (Number, Street, City, State, and ZIP Code) 3930 Chouteau Ave, St. Louis, Missouri 63110	
CHEMICAL NAME AND SYNONYMS: Acetone	TRADE NAME AND SYNONYMS: Same
CHEMICAL FAMILY: Ketones	FORMULA: C_3H_6O

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS 100		1000	FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	134	SPECIFIC GRAVITY (H_2O=1)	0.79
VAPOR PRESSURE (mm Hg.) at 68°F	180	PERCENT, VOLATILE BY VOLUME (%)	100
VAPOR DENSITY (AIR=1)	2.0	EVAPORATION RATE (NBAC = 1)	5.6
SOLUBILITY IN WATER	100%		
APPEARANCE AND ODOR: Colorless mobile liquid, mild odor			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
15°F TOC	2.6 - 12.8		

EXTINGUISHING MEDIA: Dry Chemical, Alcohol Foam, CO_2

SPECIAL FIRE FIGHTING PROCEDURES: Handle as very flammable liquid

UNUSUAL FIRE AND EXPLOSION HAZARDS:

cc B. Groves 7-1-81

(Continued on reverse side)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
1000 PPM

EFFECTS OF OVEREXPOSURE
Dizziness, anesthesia by inhalation "hangover" and recovery

EMERGENCY AND FIRST AID PROCEDURES
Remove victim to fresh air. If breathing has stopped give artificial respiration.

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		Sparks and open flames
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*
Strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Flush with copious quantities of water. Avoid sparks or open flames. Avoid flushing into confined areas. Wear respiratory protection.

WASTE DISPOSAL METHOD
Flush with water or controlled burning.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*
Emergencies-organic cannister or air pack

VENTILATION		
	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)* As Required	OTHER

PROTECTIVE GLOVES Rubber

EYE PROTECTION
Goggles to prevent splash in eye

OTHER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Highly flammable
Prevent skin contact to avoid de-fatting action.

OTHER PRECAUTIONS
Normal good personal hygiene

[redacted]

[redacted]

Shellac, Alkyd & Epoxy Abrasive

Sterling Abrasive Products Co.

[redacted]

Shellac, Alkyd & Epoxy ABRASIVE

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

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PRODUCT

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

3-20-86

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
STERLING ABRASIVE PRODUCTS CO.	(419) 447-9321
ADDRESS (Number, Street, City, State, and ZIP Code) 525 WALL STREET, TIFFIN, OHIO 44883	
CHEMICAL NAME AND SYNONYMS SHELLAC, ALKYD & EPOXY ABRASIVE PRODUCT	TRADE NAME AND SYNONYMS A and/or C ABRASIVE & E, ED, EC, or EP BONDS
CHEMICAL FAMILY OXIDE and/or CARBIDE & ORGANIC RESIN	FORMULA AL_2O_3 and/or SiC & ORGANIC RESIN

SECTION II - HAZARDOUS INGREDIENTS

CHEMICAL NAME	COMMON NAME	CAS#	OSHA PEL	ACGIH-TLV	CARCINOGEN Y/N
Aluminum Oxide	Alumina	1344-28-1	15 Mg/M^3	10 Mg/M^3	N
and/or					
Silicon Cabide	Carbide	7440-67-21	15 Mg/M_3^3	10 Mg/M_3^3	N
Titanium Dioxide	Titania	13463-67-7	15 Mg/M^3	10 Mg/M_3^3	N
Glass	Frit	N/A		10 Mg/M^3	N

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	N/A	SPECIFIC GRAVITY (H_2O=1)	N/A
VAPOR PRESSURE (mm Hg.)	N/A	PERCENT, VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=1)	N/A	EVAPORATION RATE (_____ _____ =1)	N/A
SOLUBILITY IN WATER	Slight		
APPEARANCE AND ODOR	Solid - may give off some odor in use		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	LEL	UEL
N/A	N/A	N/A	N/A

EXTINGUISHING MEDIA: Water or CO_2

SPECIAL FIRE FIGHTING PROCEDURES: None

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

N/A = Not Applicable

(Continued on reverse side)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE:
10 mg/M³ AL2O3 or SiC

EFFECTS OF OVEREXPOSURE
Inhalation - Coughing, Shortness of Breath; Skin - Irritation; Eyes- Irritation;
Ingestion - No None effects but not recommended.

EMERGENCY AND FIRST AID PROCEDURES
Inhalation - Remove to fresh air. Obtain medical assistance if needed.
Skin - Wash with soap & water; Eyes - Flush with large amounts of clean water -
obtain medical assistance.

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		Avoid strong acids, bases, extreme heat or cold
	STABLE	X	or sudden temperature change.

INCOMPATABILITY *(Materials to avoid)*
NONE

HAZARDOUS DECOMPOSITION PRODUCTS
Dust arising from use should be controlled within TLV's

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		N/A
	WILL NOT OCCUR	X	N/A

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Normal clean-up

No special steps needed

WASTE DISPOSAL METHOD
Standard landfill methods consistent with federal, state and local laws.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)* See OSHA 29 CFR 1910.134
MSHA or NIOSH approved respirator may be required if TLV's exceeded.

VENTILATION		
	LOCAL EXHAUST See OSHA 29 CFR 1910.94 Recommended- See ANSI Z43.1	SPECIAL Dependant of workpiece
	MECHANICAL *(General)* See OSHA 29 CFR 1910.94 Recommended - See ANSI Z43.1	OTHER N/A

PROTECTIVE GLOVES
As desired by operator

EYE PROTECTION
Required - see OSHA 29 CFR 1910.133

OTHER PROTECTIVE EQUIPMENT
Apron and face shield as desired - Hearing Protection - see OSHA 29 CRF 1910.95

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid mechanical damage; handle and store in accordance with ANSI B7.1 - allow wheels to warm to room temperature before using. Always use wheels in accordance with ANSI

OTHER PRECAUTIONS
B7.1, ANSI Z43.1 and OSHA 29 CFR 1910.215. Never use wheels suspected of being dropped, cracked or damaged, always use a safety guard. Never exceed the maximum operating speed marked on the wheel.

[redacted]

PELLA OIL 911

SHELL OIL CO.

[redacted]

[redacted]

PELLA Oil 911

(57)

ADAPTED FROM USDL
FORM NO LSB-005-4-MAY 1959

SHELL OIL COMPANY
SHELL CHEMICAL COMPANY
SHELL DEVELOPMENT COMPANY
SHELL PIPE LINE CORPORATION

MSDS 60500-1

HAZARD RATING

NFPA

MATERIAL SAFETY DATA SHEET

Information on this form is furnished solely for the purpose of compliance with the Occupational Safety and Health Act of 1970 and shall not be used for any other purpose. Use or dissemination of all or any part of this information for any other purpose may result in a violation of law or constitute grounds for legal action.

SECTION I

MANUFACTURER'S NAME: Shell Oil Company	EMERGENCY TELEPHONE NO.: (713) 473-9461
ADDRESS (Number, Street, City, State, and ZIP Code): One Shell Plaza - Houston, Texas 77002	
CHEMICAL NAME AND SYNONYMS: Mineral seal oil	TRADE NAME: PELLA(R) Oil 911
CHEMICAL FAMILY: Hydrocarbon	FORMULA: Code 61900

SECTION II HAZARDOUS INGREDIENTS*

COMPOSITION	%	SPECIES	LD_{50} ORAL	LD_{50} DERMAL	LC_{50} CONCENTRATION	LC_{50} HOURS
Petroleum hydrocarbons	100					
PELLA Oil 911 is a low viscosity mineral oil. Its properties are intermediate between those of kerosene and conventional mineral oil.						
This product, a refined petroleum mineral oil, is a mixture of paraffinic, napthenic, aromatic and small amounts of heterocyclic (N and S) hydrocarbons. As with other petroleum oils, the aromatics contain polycyclic compounds of varying concentration and composition. Some of the polycyclics may be those which have been shown to induce skin cancer in animals. Particular attention should be paid to Section V, VIII and IX of this data sheet.						

SECTION III PHYSICAL DATA

BOILING POINT (°F)		SPECIFIC GRAVITY (H_2O=1)	0.87
VAPOR PRESSURE (mmHg)		PERCENT VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____=1)	
SOLUBILITY IN WATER	Insol.		
APPEARANCE AND ODOR: Light colored liquid - characteristic odor.			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
255°F PMCC	N.A.		

EXTINGUISHING MEDIA: Dry chemical type preferred.

SPECIAL FIRE FIGHTING PROCEDURES: None special

UNUSUAL FIRE AND EXPLOSION HAZARDS: None unusual.

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
Vapor - not established; oil mist - 5 mg/m^3 of air.

EFFECTS OF OVEREXPOSURE
Pulmonary irritation possible. Defattying action on skin. Prolonged or repeated contact may cause skin disorders such as dermatitis, folliculitis, oil acne or even skin cancer.

EMERGENCY AND FIRST AID PROCEDURES
Eyes-flush with water at least 15 minutes. Skin-remove oil and wash affected area with soap & water. Remove all contaminated clothing. Ingestion-do not induce vomiting, guard against aspiration into lungs; get medical attention.

SECTION VI REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		Mist formation; excessive heat.
	STABLE	X	

INCOMPATIBILITY (Materials to avoid)
CO, CO_2 and oxygenates can be formed during combustion.

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Absorb with clay, diatomaceous earth, or other inert material.

WASTE DISPOSAL METHOD
Controlled burning in accordance with local regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)
None normally required; NIOSH approved respirator against vapors and mist.

VENTILATION		
	LOCAL EXHAUST: As required if mist is being generated	SPECIAL
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES: Oil-resistant

EYE PROTECTION: Goggles if oil is being sprayed or splashed.

OTHER PROTECTIVE EQUIPMENT
None normally needed.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid breathing of oil mist and vapors of hot oil; avoid repeated or prolonged skin contact.

OTHER PRECAUTIONS
Launder contaminated clothing before reuse. Discard leather goods when contaminated. Wash before eating or smoking.

NAME H. Low, Staff Technologist
TITLE Regulatory Affairs-Chemical Products
COMPANY Shell Oil
SIGNATURE
DATE December, 1976

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

(28)

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

#229 Johnson Floor Cleaner

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
MATTER, INC.	314-677-4301

ADDRESS (Number, Street, City, State, and ZIP Code): 2337 Gloucester Road, High Ridge, Mo. 63049

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
129	#229 (JOHNSON) FLOOR CLEANER
CHEMICAL FAMILY: Sodium Metasilicate, NaTripolyphosphate, TSP	FORMULA: ButalSolvasol KCH & Wetting Agent

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS		NA	BASE METAL		NA
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.) Approx. 220°F		SPECIFIC GRAVITY (H_2O=1)	1.10
VAPOR PRESSURE (mm Hg.)	as water	PERCENT, VOLATILE BY VOLUME (%)	85%
VAPOR DENSITY (AIR=1)	as water	EVAPORATION RATE (_____ =1)	as water
SOLUBILITY IN WATER Completely soluble			
APPEARANCE AND ODOR Pink liquid			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) None	FLAMMABLE LIMITS	Lel	Uel

EXTINGUISHING MEDIA

SPECIAL FIRE FIGHTING PROCEDURES

UNUSUAL FIRE AND EXPLOSION HAZARDS

JOHNSON CHEM. CO.
PO BOX 208
HIGH RIDGE, MO. 63049
314-677-4301
JOHNSON CLEANER SWIPE 129, 229

(Continued on reverse side)

C01371

229

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

Not established.

EFFECTS OF OVEREXPOSURE

A few may experience skin rash --Equally as harmful to eyes as most dish washing compounds

EMERGENCY AND FIRST AID PROCEDURES

Flood effected areas with water. If contact with eyes flush with water for fifteen minutes ...Seek medical aid.

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	XX	

INCOMPATABILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	XXX	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Dilute with water. Mop or sweep up....flush to sewer

WASTE DISPOSAL METHOD NORMAL FOR DETERGENTS

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES SUGGESTED.Recommended EYE PROTECTION Advisable

OTHER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

KEEP FROM FREEZING....Store at temperatures below 120°F.

OTHER PRECAUTIONS

Aerothene RTT Solvent

MATERIAL SAFETY DATA SHEET

D ' Chemical U.S.A. Midland, MI 48674 Emergency Phone: 517-636-4400

MSD: 000013 Page: 1

PRODUCT NAME: AEROTHENE (R) TT SOLVENT

Effective Date: 10/04/85 Date Printed: 10/07/85 Product Code: 06350

1. INGREDIENTS:

1,1,1-Trichloroethane	CAS# 000071-55-6	93.4%
Tert-butyl alcohol	CAS# 000075-65-0	
1,2-Butylene oxide	CAS# 000106-88-7	
Dimethoxymethane	CAS# 000109-87-5	

2. PHYSICAL DATA:

BOILING POINT: 165F (74C)
VAP PRESS: 100 mmHg @ 20C
VAP DENSITY: 4.55
SOL. IN WATER: 0.07g/100g @ 25C
SP. GRAVITY: 1.298 @ 25/25C
APPEARANCE: Colorless liquid.
ODOR: Irritating odor at high concentrations.

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: None
METHOD USED: TOC, TCC, COC

FLAMMABLE LIMITS
LFL: 6% @ 25C
UFL: 16.7% @ 25C

EXTINGUISHING MEDIA: Water fog.

FIRE & EXPLOSION HAZARDS: Not available.

FIRE-FIGHTING EQUIPMENT: Positive pressure, self-contained respiratory equipment.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Avoid open flames, welding arcs, or other high temperature sources which induce thermal decomposition.

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4. REACTIVITY DATA: (Continued)

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Water - long term contact can deplete stabilizers followed by slow hydrolysis producing corrosive acid. Avoid prolonged contact with, or storage in aluminum and its alloys. Metallic aluminum and zinc powders should be avoided.

HAZARDOUS DECOMPOSITION PRODUCTS: Hydrogen chloride and very small amounts of phosgene and chlorine.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Small leaks: Mop up, wipe up, or soak up immediately. Remove to out-of-doors. Large spills: Evacuate area. Contain liquid; transfer to closed metal containers. Keep out of water supply.

DISPOSAL METHOD: When disposing of the unused contents, the preferred options are to send to licensed reclaimer, permitted incinerators, or to evaporate very small quantities in compliance with local, state, and federal regulations including Subtitle C of the Resource Conservation and Recovery Act. Dumping into sewers, on the ground, or into any body of water is strongly discouraged, and may be illegal. Consult The Dow Chemical Company for further information.

6. HEALTH HAZARD DATA:

EYE: May cause pain. May cause slight transient (temporary) irritation with slight transient corneal injury. Vapors may irritate eyes.

SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation. Repeated contact may cause drying or flaking of skin.

SKIN ABSORPTION: A single prolonged skin exposure is not likely

(Continued on Page 3)

6. HEALTH HAZARD DATA: (Continued)

to result in absorption of harmful amounts. The LD50 for rabbits is about 15,000 mg/kg for 1,1,1-trichloroethane.

INGESTION: Single dose oral toxicity is low. The LD50 for rats is >10,000 mg/kg for 1,1,1-trichloroethane. If aspirated (liquid enters the lung), may be rapidly absorbed through the lungs and result in injury to other body systems.

INHALATION: Minimal anesthetic or narcotic effects may be seen in the range of 500-1000 ppm trichloroethane. Progressively higher levels over 1000 ppm may cause dizziness, drunkenness; concentrations as low as 10,000 ppm can cause unconsciousness and death. In confined or poorly ventilated areas, vapors which readily accumulate can cause unconsciousness and death. These high levels may also cause cardiac arrhythmias (irregular heartbeats).

SYSTEMIC & OTHER EFFECTS: Based on available data, repeated exposures are not anticipated to cause any significant adverse effects. 1,1,1-Trichloroethane and similar mixtures did not cause cancer in long-term animal studies.
Birth defects are unlikely. Exposures having no adverse effects on the mother should have no effect on the fetus. In animal studies, has been shown not to interfere with reproduction. Results of in vitro ("test tube") mutagenicity tests on 1,1,1-trichloroethane have been negative. Results of mutagenicity tests in animals have been negative.

7. FIRST AID:

EYES: Irrigate immediately with water for at least 5 minutes.

SKIN: Wash off in flowing water or shower. Wash contaminated clothing before reuse.

INGESTION: Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

INHALATION: Remove to fresh air. If not breathing, give

(Continued on Page 4)

7. FIRST AID: (Continued)

mouth-to-mouth resuscitation. If breathing is difficult, give oxygen. Call a physician.

NOTE TO PHYSICIAN: Because rapid absorption may occur through lungs if aspirated and cause systemic effects, the decision of whether to induce vomiting or not should be made by an attending physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. Exposure may increase "myocardial irritability". Do not administer sympathomimetic drugs unless absolutely necessary. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): 1,1,1-Trichloroethane - OSHA standard is 350 ppm and current ACGIH TLV is 350 ppm (450 ppm STEL).

ACGIH TLV and OSHA PEL are 100 ppm for t-butyl alcohol; the STEL for t-butyl alcohol is 150 ppm. Dow Industrial Hygiene Guide for 1,2-butylene oxide is 40 ppm (excursion 100 ppm). ACGIH TLV for dimethoxymethane is 1000 ppm and STEL is 1250 ppm.

VENTILATION: Control airborne concentrations below the exposure guideline. Use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations. Lethal concentrations may exist in areas with poor ventilation.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator. For emergency and other conditions where the exposure guideline may be greatly exceeded, use an approved positive pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved positive pressure self-contained breathing apparatus.

(Continued on Page 5)

8. HANDLING PRECAUTIONS: (Continued)

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron, or full body suit will depend on operation.

EYE PROTECTION: Use safety glasses. Where contact with liquid is likely, chemical goggles are recommended because eye contact with this material may cause pain, even though it is unlikely to cause injury.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Handle with reasonable care. Avoid breathing vapors. Store in a cool dry place. Concentrated vapors of AEROTHENE* TT are heavier than air and will collect in low areas such as pits, degreasers, storage tanks, and other confined areas. Do not enter these areas where vapors of AEROTHENE* TT are suspected unless special breathing apparatus is used and an observer is present for assistance.

1,1,1-Trichloroethane products should not be packaged in aluminum aerosol cans or with finely divided aluminum or its alloys in an aerosol can.

Aluminum is not an acceptable material of construction for pumps, mixers, fittings, storage tanks for 1,1,1-Trichloroethane products or formulations. Metallic aluminum and zinc powders should be avoided. For additional information on toxicity, handling precautions, and first aid, refer to Chlorinated Solvents Literature, form no. 100-5792.

MSDS STATUS: Revised 1, 5, 6, 8, and 9.

Aerothene (R) MM Solvent

MATERIAL SAFETY DATA SHEET

D Chemical U.S.A. Midland, MI 48674 Emergency Phone: 517-636-4400

MSD: 000551 Page: 1

PRODUCT NAME: AEROTHENE (R) MM SOLVENT

Effective Date: 10/04/85 Date Printed: 10/07/85 Product Code: 06547

1. INGREDIENTS:

Methylene chloride	CAS# 000075-09-2	99.5
Propylene oxide	CAS# 000075-56-9	

2. PHYSICAL DATA:

BOILING POINT: 104F (39.5C)
VAP PRESS: 340 mmHg @ 20C
VAP DENSITY: 2.93
SOL. IN WATER: 2.0 g/100g @ 25C
SP. GRAVITY: 1.320 @ 25/25C
APPEARANCE: Colorless liquid.
ODOR: Not available.

3. FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: None
METHOD USED: TOC, TCC, COC

FLAMMABLE LIMITS
LFL: 13% @ 25C
UFL: 23% @ 25C

EXTINGUISHING MEDIA: Water fog.

FIRE & EXPLOSION HAZARDS: Forms flammable vapor-air mixtures at temperatures above ambient. Lower temperatures increase the difficulty of getting it to ignite.

FIRE-FIGHTING EQUIPMENT: Wear positive pressure self-contained respiratory equipment.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Hydrolysis producing small amounts of hydrochloric acid possible with gross water contamination.

(Continued on Page 2)

4. REACTIVITY DATA: (Continued)

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Amines, possibly sodium, potassium, and magnesium.

HAZARDOUS DECOMPOSITION PRODUCTS: Open flames and welding arcs can cause thermal degradation with the evolution of hydrogen chloride and very small amounts of phosgene and chlorine.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Small spills: Mop up, wipe up or soak up immediately. Remove to out of doors. Large spills: Evacuate area. Contain liquid; transfer to closed metal containers. Keep out of water supply.

DISPOSAL METHOD: When disposing of the unused contents, the preferred options are to send to licensed reclaimer, permitted incinerators, or to evaporate very small quantities in compliance with local, state, and federal regulations including Subtitle C of The Resource Conservation and Recovery Act. Dumping into sewers, on the ground, or with any body of water is strongly discouraged, and may be illegal. Consult The Dow Chemical Company for further information.

6. HEALTH HAZARD DATA:

EYE: May cause moderate eye irritation and slight corneal injury. Vapors may irritate eyes. In animals, irritation and corneal injury healed primarily within 8 days.

SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation, even a burn. Repeated contact may cause drying or flaking of skin.

SKIN ABSORPTION: A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. The dermal LD50 has not been determined.

(Continued on Page 3)

6. HEALTH HAZARD DATA: (Continued)

INGESTION: Single dose oral toxicity is low. The oral LD50 for rats is in the range of 1500-2500 mg/kg. If aspirated (liquid enters the lung), may be rapidly absorbed through the lungs and result in injury to other body systems.

INHALATION: Minimal anesthetic or narcotic effects may be seen in the range of 500-1000 ppm methylene chloride. Progressively higher levels over 1000 ppm can cause dizziness, drunkenness; concentrations as low as 10,000 ppm can cause unconsciousness and death. These high levels may also cause cardiac arrythmias (irregular heartbeats).

Excessive exposure may cause irritation to upper respiratory tract and carboxyhemoglobinemia, thereby impairing the blood's ability to transport oxygen.

In confined or poorly ventilated areas, vapors can readily accumulate and can cause unconsciousness and death.

SYSTEMIC & OTHER EFFECTS: Excessive exposure may cause central nervous system, liver or kidney effects. Methylene chloride has been shown to increase the rate of spontaneously occurring malignant tumors in one strain of laboratory mouse and benign tumors in laboratory rats. Other animal studies, as well as several human epidemiology studies, failed to show a tumorigenic response relatable to methylene chloride. Methylene chloride is not believed to pose a measurable carcinogenic risk to man when handled as recommended. Birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother. In animal studies, has been shown not to interfere with reproduction. Negative or equivocal results have been obtained using mammalian cells or animals. This is consistent with the lack of interaction with DNA in rats and hamsters. Although results of Ames bacterial tests have generally been positive, overall the data suggest that genotoxic potential does not appear to be a significant factor in the toxicity of methylene chloride.

(Continued on Page 4)

7. FIRST AID:

EYES: Irrigate with flowing water immediately and continuously for 15 minutes. Consult medical personnel.

SKIN: Wash off in flowing water or shower. Remove contaminated clothing and wash before reuse.

INGESTION: Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

INHALATION: Remove to fresh air. If not breathing, give mouth-to-mouth resuscitation. If breathing is difficult, give oxygen. Call a physician.

NOTE TO PHYSICIAN: Because rapid absorption may occur through lungs if aspirated and cause systemic effects, the decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. Exposure may increase "myocardial irritability." Do not administer sympathomimetic drugs unless absolutely necessary. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): For methylene chloride: the ACGIH TLV is 100 ppm. OSHA PEL is 500 ppm; ACC is 1000 ppm; MAC is 2000 ppm.

For propylene oxide: the ACGIH TLV is 20 ppm. OSHA PEL is 100 ppm.

VENTILATION: Controlling airborne concentrations below the ACGIH TLV for methylene chloride exposure guideline is recommended. Use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations. Lethal concentrations may exist in areas with poor ventilation.

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8. HANDLING PRECAUTIONS: (Continued)

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator. For emergency and other conditions where the exposure guideline may be greatly exceeded, use an approved positive pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved positive pressure self-contained breathing apparatus.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron, or full body suit will depend on operation.

EYE PROTECTION: Use safety glasses. Where contact with liquid is likely, chemical goggles are recommended because eye contact with this material may cause pain, even though it is unlikely to cause injury.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Exercise reasonable care and caution. Avoid breathing vapors. Store in cool place. Concentrated vapors of AEROTHENE* MM are heavier than air and will collect in low areas such as pits, degreasers, storage tanks, and other confined areas. Do not enter these areas where vapors of AEROTHENE* MM are suspected unless special breathing apparatus is used and an observer is present for assistance.

MSDS STATUS: Revised 1, 3, 5, 6, 7, 8, and 9.

Askomet Carbide Grades

MATERIAL SAFETY DATA SHEET

ASKO, Inc.

501 West Seventh Ave.
West Homestead, PA 15120
Telephone Number:
(412) 461-4110

CHEMICAL NAME: Cemented Carbide Product with Cobalt binder.

TRADE NAME AND SYNONYMS: ASKOMET Carbide Grades

CHEMICAL FAMILY: Refractory Metal Carbide Molecular Weight: N/A

PHYSICAL DATA

Appearance and Odor: Dark Gray Metal/No Odor
Boiling Point: N/A
Vapor Pressure (mm Hg): N/A
Vapor Density (Air=1): N/A
Solubility in H_2O: Insoluble
Specific Gravity (H_2O=1): 11.0 to 15.5
Percent Volatile by Volume: 0
Evaporation rate: N/A
How Best Monitored: Air Sample

HAZARDOUS INGREDIENTS

Material	OSHA PEL (Unit)	ACGIH TLV (Unit)
Tungsten Carbide (limits for Tungsten dust)	——	5mg/M3
Cobalt	0.1mg/M3	0.1mg/M3
Tantalum Carbide (limits for Tantalum dust)	5mg/M3	5mg/M3

HEALTH HAZARD DATA

Routes of Exposure:
Grinding cemented carbide product will produce dust of potentially hazardous ingredients which can be inhaled, swallowed or come in contact with the skin or eyes.

Effects of Overexposure:

Inhalation: Dust from grinding can cause irritation of the nose and throat. It also has the potential for causing transient or permanent respiratory disease including occupational asthma and interstitial fibrosis, in a small percentage of exposed individuals. It is reported that cobalt dust is the most probable cause of such respiratory diseases. Symptoms include productive cough, wheezing, shortness of breath, chest tightness and weight loss. Interstitial fibrosis (lung scarring) can lead to permanent disability or death. Certain pulmonary conditions may be aggravated by exposure.

Skin Contact: Can cause irritation or an allergic skin rash due to cobalt sensitization. Certain skin conditions, such as dry skin, may be aggravated by exposure.

Eye Contact: Can cause irritation.

Ingestion: Reports outside the industry suggest that ingestion of significant amounts of cobalt has the potential for causing blood, heart, and other organ problems.

Emergency and First Aid Procedures: Applicable for dusts or mists.

Inhalation: If symptoms of pulmonary involvement develop (coughing, wheezing, shortness of breath, etc.) remove from exposure and seek medical attention.

Skin Contact: If irritation or rash occurs, thoroughly wash affected area with soap and water and isolate from exposure. If irritation or rash persists, seek medical attention.

Eye Contact: If irritation occurs, flush with copious amounts of water. If irritation persists, seek medical attention.

Ingestion: If subtantial quantities are swallowed, dilute with a large amount of water, induce vomiting and seek medical attention.

Carcinogenic Assessment (NTP Annual Report, IARC Monographs, other): None of the components of this material have been identified as known or suspected carcinogens by NTP, IARC or OSHA.

FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A Test Method Used: —— Flammable Limits: N/A LEL: —— UEL: ——

Hard Cemented Carbide Product is not a fire hazard. Dusts generated in grinding operations may ignite if allowed to accumulate and subjected to an ignition source.

Extinguishing Media: For powder fires, smother with dry sand, dry dolomite, ABC type fire extinguisher, or flood with water.

Special Fire Fighting Procedures: For a powder fire confined to a small area, use a respirator approved for toxic dusts and fumes. For a large fire, fire fighters should use self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Dusts may present a fire or explosion hazard under rare favoring conditions of particular size, dispersion and strong ignition source. However, this is not expected to be a problem under normal handling conditions.

REACTIVITY DATA

Stability: Unstable
Stable X

Conditions to Avoid: N/A

Incompatibility: Contact of dust with strong oxidizers may cause fire or explosions.

Materials to Avoid: Strong acids

Hazardous Decomposition Products: None

Hazardous Polymerization: May Occur
Will Not Occur X

Conditions to Avoid: N/A

SPILL OR LEAK PROCEDURES

Steps to be Taken in Case Material is Released or Spilled:

Ventilate area of spill. Clean up using methods which avoid dust generation such as vacuum (with appropriate filter to prevent airborne dust levels which exceed the PEL or TLV), wet dust mop or wet clean-up. If airborne dust is generated during clean-up, use an appropriate NIOSH approved respirator.

Waste Disposal Method:

Dispose of in accordance with appropriate government regulations. May be sold as scrap for reclaim.

SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use an appropriate NIOSH approved respirator if airborne dust concentrations exceed the appropriate PEL or TLV. All appropriate requirements set forth in 29 CFR 1910.134 should be met.

Ventilation: Use local exhaust ventilation which is adequate to limit personal exposure to airborne dust to levels which do not exceed PEL or TLV. If such equipment is not available, use respirators as specified above.

Protective Gloves: Protective Gloves or Barrier cream are recommended when contact with dust or mist is likely. Prior to applying the Barrier cream or use of protective gloves, wash thoroughly.

Eye Protection: Safety glasses with side shields or goggles should be worn when grinding or cutting.

SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storage: Maintain good housekeeping procedures to prevent dust accumulation during grinding. Avoid dust inhalation and direct skin contact with dust.

Other Precautions: Clean up using methods which avoid dust generation such as vacuum (with appropriate filter to prevent airborne dust levels which exceed the PEL or TLV), wet dust mop or wet clean-up. If airborne dust is generated, use an appropriate NIOSH approved respirator.

Wash hands thoroughly after handling, before eating or smoking. Wash exposed skin at the end of work shift. Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or vacuuming (with appropriate filters) the clothing, rags, or other items.

Periodic medical examinations are recommended for individuals regularly exposed to dust or mist.

In case of questions, please call:

ASKO, INC.
(412) 461-4110

Mr. S. A. Jacoby
Vice President

Issue Date: October 30, 1985
Supersedes: N/A

ASKODYNE H
UNISHEAR 1100
UNISHEAR 2200

MATERIAL SAFETY DATA SHEET

ASKO, Inc.

501 West Seventh Avenue
West Homestead, PA 15120
Telephone Number:
(412) 461-4110

CHEMICAL NAME: N/A

TRADE NAME AND SYNONYMS:

This Material Safety Data Sheet applies to all ASKO products produced under the following tradenames: ASKODYNE "H"™, UNISHEAR 1100™, UNISHEAR 2200™.

CHEMICAL FAMILY: (High Temperature Alloy/Super Alloy) Molecular Weight: N/A

PHYSICAL DATA

Appearance and Odor: Gray Metal/no odor
Boiling Point: N/A
Vapor Pressure (mm Hg): N/A
Vapor Density (Air=1): N/A
Solubility in H_2O: Insoluble
Specific Gravity (H_2O=1): N/A
Percentage Volatile by Volume: N/A
Evaporation rate (=1): N/A
How Best Monitored: Air Sample

HAZARDOUS INGREDIENTS

Material	OSHA PEL (Unit)	ACGIH TLV (Unit)
Iron	5mg/M3	5mg/M3
Cobalt	0.1mg/M3	0.1mg/M3
Chromium	1mg/M3 (metal)	0.5mg/M3 (metal)
Nickel	1mg/M3 (metal)	1mg/M3 (metal)
Molybdenum	15mg/M3	10mg/M3
Aluminum	—	10mg/M3 (metal)
Titanium	—	—
Columbium	—	—

HEALTH HAZARD DATA

Routes of Exposure:

When used for their intended purpose, Asko products manufactured from material referred to in this MSDS will not result in exposure to hazardous ingredients. Exposure to hazardous ingredients may occur if the alloy product is ground with inadequate local exhaust ventilation or subjected to improper grinding operations such as dry grinding both of which generate respirable dust.

Effects of Overexposure:

Acute Effects: Adverse health effects are not expected to occur after acute exposure to metallic dusts. However, relatively short-term exposures (less than 1 year) to metal dusts have been associated with chronic lung disease.

Chronic Effects: Adverse health effects, including nose and throat irritation and transient or permanent respiratory disease, have been observed after exposure to dusts encountered in the grinding and cutting of metal alloys. Since these alloys contain many different metals it has not been possible to say with absolute certainty which metal(s) is the offending agent, though Cobalt is one of the leading candidates. This particular product may also contain significant amounts of nickel and chromium, which have been associated with health effects noted below. Excessive exposure to dust caused by grinding or cutting this product may cause: 1) Dermatitis—especially in individuals sensitive to cobalt, chrome, or nickel; and 2) Lung damage. Pulmonary fibrosis has been seen in workers with excessive exposures to metal dusts. Chromium and nickel compounds have been associated with irritation, ulceration, and cancer in the respiratory system, though it is not known if metallic dusts of these elements can cause such effects.

Health Monitoring: Early recognition of the signs of lung disease from metal dust is important, since this is a progressive disease—but one which may be arrested if caught quickly and exposure is stopped. Further, workers exposed to such dusts are encouraged to not smoke cigarettes, as this habit tends to enhance many types of adverse lung effects.

Emergency and First Aid Procedures: Applicable for dusts or mists.

Inhalation: If symptoms of pulmonary involvement develop (coughing, wheezing, shortness of breath, etc.) remove from exposure and seek medical attention.

Skin Contact: If irritation or rash occurs, thoroughly wash affected area with soap and water and isolate from exposure. If irritation or rash persists, seek medical attention.

Eye Contact: If irritation occurs, flush with copious amounts of water. If irritation persists, seek medical attention.

Ingestion: If substantial quantities are swallowed, dilute with a large amount of water, induce vomiting and seek medical attention.

Carcenogenic Assessment: Nickel and chromium have been identified as known or suspected carcinogens by NTP, IARC or OSHA.

FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A Test Method Used: —— Flammable Limits: N/A

These alloy products are not a fire hazard. Dust generated in grinding operations under rare conditions may present a fire or explosion hazard. However, this is not expected to be a problem under normal handling conditions.

REACTIVITY DATA

Stability: Unstable
Stable X

Conditions to Avoid: N/A

Incompatibility:

Materials to Avoid: Strong acids

Hazardous Decomposition Products: None

Hazardous Polymerization: May Occur
Will Not Occur X

Conditions to Avoid: N/A

SPILL OR LEAK PROCEDURES

Steps to be Taken in Case Material is Released or Spilled:

Clean up using methods which avoid dust generation such as vacuum, wet mop procedures, or wet clean-up. If airborne dust is generated during clean-up, use an appropriate NIOSH approved respirator.

Waste Disposal Method:

Dispose of in accordance with appropriate federal, state, and local regulations. May be sold as scrap for reclamation.

SPECIAL PROTECTION INFORMATION

Respiratory Protection: If dusts generated during grinding and cutting cannot be controlled with local exhaust ventilation, appropriate NIOSH approved respirators should be used to prevent excessive inhalation exposures.

Ventilation: For grinding and cutting operations, local exhaust ventilation should be provided which is adequate to prevent excessive exposures to dust (those which do not exceed relevant OSHA PEL's).

Protective Gloves: Protective Gloves or Barrier cream are recommended when contact with dust or mist is likely. Prior to applying the Barrier cream or use of protective gloves, wash thoroughly.

Eye Protection: Safety glasses with side shields or goggles should be worn when grinding or cutting.

SPECIAL PRECAUTIONS

Dusts from grinding this product are dangerous! Resharpening or grinding should be done using accepted *wet grinding* practices, so that generation of dust is minimized. If dry grinding is unavoidable, precautions must be taken to limit worker exposure: local exhaust ventilation should be provided to keep exposure below the TLV. If ventilation is not sufficient, personal respiratory protection must be provided.

Other Precautions:

Wash thoroughly after handling, before eating or smoking. Wash exposed skin at the end of the work shift. Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or vacuuming (with appropriate filters) the clothing, rags, or other items.

Periodic medical examinations are recommended for individuals regularly exposed to dust or mist.

In case of questions, please call:

ASKO, INC.
(412) 461-4110

Mr. S. A. Jacoby
Vice President

Issue Date: September, 1985
Supersedes: N/A

Bronze Scrap

MATERIAL SAFETY DATA SHEET

I. MATERIAL IDENTIFICATION

Manufacturer's Name: Kripke Tuschman Industries, Inc. Telephone Number: (419) 537-9400
Address: 2453 Hill Avenue Toledo, Ohio 43607

Material Name: Bronze Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Copper	(7440-50-8)	>66	(Dust)	1 mg/m^3	1 mg/m^3	2 mg/m^3
			(Fume)	0.1 mg/m^3	0.2 mg/m^3	—
Lead	(7439-92-1)	≤25		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Tin	(7440-31-5)	≤20		2 mg/m^3	2 mg/m^3	4 mg/m^3
Aluminum	(7429-90-5)	≤15	(Dust)	—	10 mg/m^3	20 mg/m^3
			(Fume)	—	5 mg/m^3	—
Manganese	(7439-96-5)	≤14	(Dust)	5 mg/m^3 *	5 mg/m^3 *	—
			(Fume)	—	1 mg/m^3	3 mg/m^3
Iron	(1309-37-1)	≤ 6		10 mg/m^3	5 mg/m^3 (as iron oxide fume)	10 mg/m^3
Nickel	(7440-02-0)	≤ 6		1 mg/m^3	1 mg/m^3	—
Zinc	(1314-13-2)	≤ 6	(Dust)	—	(2)	—
			(Fume)	5 mg/m^3	5 mg/m^3 (as zinc oxide)	10 mg/m^3
Silicon	(7440-21-3)	≤ 4		(1)	(2)	20 mg/m^3
Phosphorus	(7723-14-0)	< 2		0.1 mg/m^3	0.1 mg/m^3	0.3 mg/m^3
Antimony	(7440-36-0)	< 1		0.5 mg/m^3	0.5 mg/m^3	—
Arsenic	(7440-38-2)	< 1		0.01 mg/m^3	0.2 mg/m^3	—
Chromium	(7440-47-3)	< 1		1 mg/m^3	0.5 mg/m^3	—
Cobalt	(7440-48-4)	< 1		0.1 mg/m^3	0.1 mg/m^3	—

* Ceiling Limit

(1) <1% quartz, 15 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

(2) <1% quartz, 10 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

Note: Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

C01374

III. PHYSICAL DATA

Melting Point: 999 - 1077° C
Specific Gravity: 7.50 - 9.30
Boiling Point (of copper): 2324° C
Vapor Pressure: 1 mm Hg @ 1628° C (of copper)
Solubility in water: insoluble

Appearance: dependent on composition of scrap metal, processing method used, and existing protective coatings.

IV. FIRE AND EXPLOSION DATA

Flash Point: information not available
Flammability Limits: information not available
Autoignition Temperature: information not available

Bronze scrap itself presents a negligible fire and explosion hazard. A moderate fire and explosion hazard may exist due to contamination, or when the material is finely divided and exposed to heat or flames. Phosphorus dust presents a serious fire and explosion hazard when exposed to heat or oxidizers.

Fire Extinguishing Methods: Use dry chemical or sand. Fire fighters should wear self-contained breathing apparatus and full protective clothing.

V. REACTIVITY DATA

Copper reacts violently with acetylene. Material may also be incompatible with acids, bases, and oxidizers. Dust presents moderate fire and explosion hazards. Molten scrap metal may react violently with water. For additional information, users should consult data sheets on individual component elements.

VI. HEALTH HAZARD DATA

TLV: see Section II.
Primary Routes of Entry: inhalation of dust or fume.

Under normal handling and use, exposure to the massive form of bronze scrap presents few health hazards. Thermal cutting and melting of scrap may produce fumes containing the component elements, and breathing these fumes may present potentially significant health hazards. The exposure levels in Section II are relevant to fumes and dusts. Special precautions should be taken if scrap is contaminated; see Section IX.

Fumes of copper, manganese, and zinc oxide may cause metal fume fever with flu-like symptoms. Copper may cause skin and hair discoloration. Overexposure to dusts and especially fumes containing component elements may cause skin, nose, mouth, and eye irritation and lung changes in workers, potentially leading to pulmonary diseases.

Chromium and nickel compounds have been associated with allergic reactions and rashes, and lung changes. Nickel is a respiratory irritant and can cause pneumonitis. Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Cobalt is irritating to the eyes and skin and can cause allergic dermatitis, especially in combination with nickel and chromium.

Overexposure to manganese fumes can cause chronic manganese poisoning. Early symptoms include headaches, apathy, sleepiness, and weakness or cramps in the legs. Chronic overexposure can affect the central nervous system, ultimately leading to emotional disturbances, gait and balance difficulties, and paralysis.

Overexposure to antimony may cause gastrointestinal upset and various nervous complaints, such as sleeplessness, irritability, and muscular pains. Inhalation of lead fumes and dusts, or ingestion of lead compounds, can cause lead poisoning, characterized by abdominal pains, joint and muscle pains, or weakness. Prolonged overexposure can cause central nervous system disorders.

Overexposure to arsenic fumes or dusts can lead to arsenic poisoning, characterized by nausea, vomiting, and diarrhea. Prolonged overexposure can lead to liver and kidney damage, central nervous system disorders, and ultimately death. Arsenic can cause skin irritation and allergic reactions.

Overexposure to tin dusts may cause irritation of the skin and mucous membranes, and may result in a benign pneumoconiosis (stannosis). Absorption of large quantities of phosphorus can cause liver damage and necrosis of the jaw.

Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential cancer-causing agents.

FIRST AID:

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Brush off excess dust. Wash area well with soap and water.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical help if large quantities of material have been ingested. (Ingestion of significant amounts of scrap metal is unlikely.)

VII. SPILL PROCEDURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should wear respirators and protective clothing.

Scrap metal can be reclaimed for reuse. Follow Federal, State, and Local regulations regarding disposal.

VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation to keep airborne concentrations of dust or fumes below the TLV. Employees should wear MSHA or NIOSH approved respirators for protection against airborne dust or fumes. Full protective clothing should be worn by workers exposed to heavy concentrations of dust, and showering should be required before changing into street clothes. Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Approved safety glasses or goggles should be worn when working with dusty material. Safety eyewash stations should be provided in close proximity to work areas.

Pre-employment and periodic medical evaluations should be provided. Attention should be directed toward skin, eyes, teeth, respiratory tract, liver, kidneys, blood, pulmonary function, and neurologic health. Chest X-rays should be included if symptoms are present.

Food should not be consumed in the work area.

Special attention is drawn to the requirements of the Occupational Safety and Health Administration standards for lead (29 CFR 1910.1025) and arsenic (29 CFR 1910.1018). State OSHA programs will also have similar requirements.

Special precautions should be taken if scrap is contaminated; see Section IX.

IX. SPECIAL PRECAUTIONS

Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum.

Store material away from incompatible materials, and keep dust away from sources of ignition.

This material is potentially contaminated with coatings, preservatives, oil, and other contaminants. If the material is contaminated, special precautions (such as process control and personal protective equipment, appropriate to the nature of the suspected contaminants) should be taken to avoid resulting exposures when handling, cutting (mechanical or thermal), and/or melting.

Prepared by: Institute of Scrap Iron and Steel (ISIS)
in consultation with JRB Associates

Date Prepared: September 1985

Bronze Scrap

MATERIAL SAFETY DATA SHEET

Mason City Iron & Metal Co.
2200 South Pierce
Mason City, Iowa 50401
Manufacturer's Name:
Address:

Telephone Number: 1-515-423-2155

I. MATERIAL IDENTIFICATION

Material Name: Bronze Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Copper	(7440-50-8)	>66	(Dust) (Fume)	1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	2 mg/m^3 --
Lead	(7439-92-1)	≤25		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Tin	(7440-31-5)	≤20		2 mg/m^3	2 mg/m^3	4 mg/m^3
Aluminum	(7429-90-5)	≤15	(Dust) (Fume)	-- --	10 mg/m^3 5 mg/m^3	20 mg/m^3 --
Manganese	(7439-96-5)	≤14	(Dust) (Fume)	5 mg/m^3 * --	5 mg/m^3 * 1 mg/m^3	-- 3 mg/m^3
Iron	(1309-37-1)	≤ 6		10 mg/m^3	5 mg/m^3 (as iron oxide fume)	10 mg/m^3
Nickel	(7440-02-0)	≤ 6		1 mg/m^3	1 mg/m^3	--
Zinc	(1314-13-2)	≤ 6	(Dust) (Fume)	-- 5 mg/m^3	(2) 5 mg/m^3 (as zinc oxide)	-- 10 mg/m^3
Silicon	(7440-21-3)	≤ 4		(1)	(2)	20 mg/m^3
Phosphorus	(7723-14-0)	< 2		0.1 mg/m^3	0.1 mg/m^3	0.3 mg/m^3
Antimony	(7440-36-0)	< 1		0.5 mg/m^3	0.5 mg/m^3	--
Arsenic	(7440-38-2)	< 1		0.01 mg/m^3	0.2 mg/m^3	--
Chromium	(7440-47-3)	< 1		1 mg/m^3	0.5 mg/m^3	--
Cobalt	(7440-48-4)	< 1		0.1 mg/m^3	0.1 mg/m^3	--

* Ceiling Limit

(1) <1% quartz, 15 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

(2) <1% quartz, 10 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

Note: Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

(9/85)

C01375

III. PHYSICAL DATA

Melting Point: 999 - 1077° C
Specific Gravity: 7.50 - 9.30
Boiling Point (of copper): 2324° C
Vapor Pressure: 1 mm Hg @ 1628° C (of copper)
Solubility in water: insoluble

Appearance: dependent on composition of scrap metal, processing method used, and existing protective coatings.

IV. FIRE AND EXPLOSION DATA

Flash Point: information not available
Flammability Limits: information not available
Autoignition Temperature: information not available

Bronze scrap itself presents a negligible fire and explosion hazard. A moderate fire and explosion hazard may exist due to contamination, or when the material is finely divided and exposed to heat or flames. Phosphorus dust presents a serious fire and explosion hazard when exposed to heat or oxidizers.

Fire Extinguishing Methods: Use dry chemical or sand. Fire fighters should wear self-contained breathing apparatus and full protective clothing.

V. REACTIVITY DATA

Copper reacts violently with acetylene. Material may also be incompatible with acids, bases, and oxidizers. Dust presents moderate fire and explosion hazards. Molten scrap metal may react violently with water. For additional information, users should consult data sheets on individual component elements.

VI. HEALTH HAZARD DATA

TLV: see Section II.
Primary Routes of Entry: inhalation of dust or fume.

Under normal handling and use, exposure to the massive form of bronze scrap presents few health hazards. Thermal cutting and melting of scrap may produce fumes containing the component elements, and breathing these fumes may present potentially significant health hazards. The exposure levels in Section II are relevant to fumes and dusts. Special precautions should be taken if scrap is contaminated; see Section IX.

Fumes of copper, manganese, and zinc oxide may cause metal fume fever with flu-like symptoms. Copper may cause skin and hair discoloration. Overexposure to dusts and especially fumes containing component elements may cause skin, nose, mouth, and eye irritation and lung changes in workers, potentially leading to pulmonary diseases.

Chromium and nickel compounds have been associated with allergic reactions and rashes, and lung changes. Nickel is a respiratory irritant and can cause pneumonitis. Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Cobalt is irritating to the eyes and skin and can cause allergic dermatitis, especially in combination with nickel and chromium.

Overexposure to manganese fumes can cause chronic manganese poisoning. Early symptoms include headaches, apathy, sleepiness, and weakness or cramps in the legs. Chronic overexposure can affect the central nervous system, ultimately leading to emotional disturbances, gait and balance difficulties, and paralysis.

Overexposure to antimony may cause gastrointestinal upset and various nervous complaints, such as sleeplessness, irritability, and muscular pains. Inhalation of lead fumes and dusts, or ingestion of lead compounds, can cause lead poisoning, characterized by abdominal pains, joint and muscle pains, or weakness. Prolonged overexposure can cause central nervous system disorders.

Overexposure to arsenic fumes or dusts can lead to arsenic poisoning, characterized by nausea, vomiting, and diarrhea. Prolonged overexposure can lead to liver and kidney damage, central nervous system disorders, and ultimately death. Arsenic can cause skin irritation and allergic reactions.

Overexposure to tin dusts may cause irritation of the skin and mucous membranes, and may result in a benign pneumoconiosis (stannosis). Absorption of large quantities of phosphorus can cause liver damage and necrosis of the jaw.

Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential cancer-causing agents.

FIRST AID:

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Brush off excess dust. Wash area well with soap and water.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical help if large quantities of material have been ingested. (Ingestion of significant amounts of scrap metal is unlikely.)

VII. SPILL PROCEDURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should wear respirators and protective clothing.

Scrap metal can be reclaimed for reuse. Follow Federal, State, and Local regulations regarding disposal.

VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation to keep airborne concentrations of dust or fumes below the TLV. Employees should wear MSHA or NIOSH approved respirators for protection against airborne dust or fumes. Full protective clothing should be worn by workers exposed to heavy concentrations of dust, and showering should be required before changing into street clothes. Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Approved safety glasses or goggles should be worn when working with dusty material. Safety eyewash stations should be provided in close proximity to work areas.

Pre-employment and periodic medical evaluations should be provided. Attention should be directed toward skin, eyes, teeth, respiratory tract, liver, kidneys, blood, pulmonary function, and neurologic health. Chest X-rays should be included if symptoms are present.

Food should not be consumed in the work area.

Special attention is drawn to the requirements of the Occupational Safety and Health Administration standards for lead (29 CFR 1910.1025) and arsenic (29 CFR 1910.1018). State OSHA programs will also have similar requirements.

Special precautions should be taken if scrap is contaminated; see Section IX.

IX. SPECIAL PRECAUTIONS

Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum.

Store material away from incompatible materials, and keep dust away from sources of ignition.

This material is potentially contaminated with coatings, preservatives, oil, and other contaminants. If the material is contaminated, special precautions (such as process control and personal protective equipment, appropriate to the nature of the suspected contaminants) should be taken to avoid resulting exposures when handling, cutting (mechanical or thermal), and/or melting.

Prepared by: Institute of Scrap Iron and Steel (ISIS)
in consultation with JRB Associates

Date Prepared: September 1985

Bronze Scrap

MATERIAL SAFETY DATA SHEET

Mason City Iron & Metal Co.
2200 South Pierce
Mason City, Iowa 50401
Manufacturer's Name:
Address:

I. MATERIAL IDENTIFICATION

Telephone Number: 1-515-423-2155

Material Name: Bronze Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Copper	(7440-50-8)	>66	(Dust) (Fume)	1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	2 mg/m^3 --
Lead	(7439-92-1)	≤25		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Tin	(7440-31-5)	≤20		2 mg/m^3	2 mg/m^3	4 mg/m^3
Aluminum	(7429-90-5)	≤15	(Dust) (Fume)	-- --	10 mg/m^3 5 mg/m^3	20 mg/m^3 --
Manganese	(7439-96-5)	≤14	(Dust) (Fume)	5 mg/m^3 * --	5 mg/m^3 * 1 mg/m^3	-- 3 mg/m^3
Iron	(1309-37-1)	≤ 6		10 mg/m^3	5 mg/m^3 (as iron oxide fume)	10 mg/m^3
Nickel	(7440-02-0)	≤ 6		1 mg/m^3	1 mg/m^3	--
Zinc	(1314-13-2)	≤ 6	(Dust) (Fume)	-- 5 mg/m^3	(2) 5 mg/m^3 (as zinc oxide)	-- 10 mg/m^3
Silicon	(7440-21-3)	≤ 4		(1)	(2)	20 mg/m^3
Phosphorus	(7723-14-0)	< 2		0.1 mg/m^3	0.1 mg/m^3	0.3 mg/m^3
Antimony	(7440-36-0)	< 1		0.5 mg/m^3	0.5 mg/m^3	--
Arsenic	(7440-38-2)	< 1		0.01 mg/m^3	0.2 mg/m^3	--
Chromium	(7440-47-3)	< 1		1 mg/m^3	0.5 mg/m^3	--
Cobalt	(7440-48-4)	< 1		0.1 mg/m^3	0.1 mg/m^3	--

* Ceiling Limit

(1) <1% quartz, 15 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

(2) <1% quartz, 10 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

Note: Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

C01375

III. PHYSICAL DATA

Melting Point: 999 - 1077° C
Specific Gravity: 7.50 - 9.30
Boiling Point (of copper): 2324° C
Vapor Pressure: 1 mm Hg @ 1628° C (of copper)
Solubility in water: insoluble

Appearance: dependent on composition of scrap metal, processing method used, and existing protective coatings.

IV. FIRE AND EXPLOSION DATA

Flash Point: information not available
Flammability Limits: information not available
Autoignition Temperature: information not available

Bronze scrap itself presents a negligible fire and explosion hazard. A moderate fire and explosion hazard may exist due to contamination, or when the material is finely divided and exposed to heat or flames. Phosphorus dust presents a serious fire and explosion hazard when exposed to heat or oxidizers.

Fire Extinguishing Methods: Use dry chemical or sand. Fire fighters should wear self-contained breathing apparatus and full protective clothing.

V. REACTIVITY DATA

Copper reacts violently with acetylene. Material may also be incompatible with acids, bases, and oxidizers. Dust presents moderate fire and explosion hazards. Molten scrap metal may react violently with water. For additional information, users should consult data sheets on individual component elements.

VI. HEALTH HAZARD DATA

TLV: see Section II.
Primary Routes of Entry: inhalation of dust or fume.

Under normal handling and use, exposure to the massive form of bronze scrap presents few health hazards. Thermal cutting and melting of scrap may produce fumes containing the component elements, and breathing these fumes may present potentially significant health hazards. The exposure levels in Section II are relevant to fumes and dusts. Special precautions should be taken if scrap is contaminated; see Section IX.

Fumes of copper, manganese, and zinc oxide may cause metal fume fever with flu-like symptoms. Copper may cause skin and hair discoloration. Overexposure to dusts and especially fumes containing component elements may cause skin, nose, mouth, and eye irritation and lung changes in workers, potentially leading to pulmonary diseases.

Chromium and nickel compounds have been associated with allergic reactions and rashes, and lung changes. Nickel is a respiratory irritant and can cause pneumonitis. Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Cobalt is irritating to the eyes and skin and can cause allergic dermatitis, especially in combination with nickel and chromium.

Overexposure to manganese fumes can cause chronic manganese poisoning. Early symptoms include headaches, apathy, sleepiness, and weakness or cramps in the legs. Chronic overexposure can affect the central nervous system, ultimately leading to emotional disturbances, gait and balance difficulties, and paralysis.

Overexposure to antimony may cause gastrointestinal upset and various nervous complaints, such as sleeplessness, irritability, and muscular pains. Inhalation of lead fumes and dusts, or ingestion of lead compounds, can cause lead poisoning, characterized by abdominal pains, joint and muscle pains, or weakness. Prolonged overexposure can cause central nervous system disorders.

Overexposure to arsenic fumes or dusts can lead to arsenic poisoning, characterized by nausea, vomiting, and diarrhea. Prolonged overexposure can lead to liver and kidney damage, central nervous system disorders, and ultimately death. Arsenic can cause skin irritation and allergic reactions.

Overexposure to tin dusts may cause irritation of the skin and mucous membranes, and may result in a benign pneumoconiosis (stannosis). Absorption of large quantities of phosphorus can cause liver damage and necrosis of the jaw.

Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential cancer-causing agents.

FIRST AID:

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Brush off excess dust. Wash area well with soap and water.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical help if large quantities of material have been ingested. (Ingestion of significant amounts of scrap metal is unlikely.)

VII. SPILL PROCEDURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should wear respirators and protective clothing.

Scrap metal can be reclaimed for reuse. Follow Federal, State, and Local regulations regarding disposal.

VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation to keep airborne concentrations of dust or fumes below the TLV. Employees should wear MSHA or NIOSH approved respirators for protection against airborne dust or fumes. Full protective clothing should be worn by workers exposed to heavy concentrations of dust, and showering should be required before changing into street clothes. Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Approved safety glasses or goggles should be worn when working with dusty material. Safety eyewash stations should be provided in close proximity to work areas.

Pre-employment and periodic medical evaluations should be provided. Attention should be directed toward skin, eyes, teeth, respiratory tract, liver, kidneys, blood, pulmonary function, and neurologic health. Chest X-rays should be included if symptoms are present.

Food should not be consumed in the work area.

Special attention is drawn to the requirements of the Occupational Safety and Health Administration standards for lead (29 CFR 1910.1025) and arsenic (29 CFR 1910.1018). State OSHA programs will also have similar requirements.

Special precautions should be taken if scrap is contaminated; see Section IX.

IX. SPECIAL PRECAUTIONS

Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum.

Store material away from incompatible materials, and keep dust away from sources of ignition.

This material is potentially contaminated with coatings, preservatives, oil, and other contaminants. If the material is contaminated, special precautions (such as process control and personal protective equipment, appropriate to the nature of the suspected contaminants) should be taken to avoid resulting exposures when handling, cutting (mechanical or thermal), and/or melting.

Prepared by: Institute of Scrap Iron and Steel (ISIS)
in consultation with JRB Associates

Date Prepared: September 1985

P & W INDUSTRIES, INC.
P. O. BOX [illegible]
COVINGTON, LA 7043[illegible]

MATERIAL SAFETY DATA SHEET

Bronze Scrap

I. MATERIAL IDENTIFICATION

Manufacturer's Name: Telephone Number:
Address:

Material Name: Bronze Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Copper	(7440-50-8)	>66	(Dust) (Fume)	1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	2 mg/m^3 --
Lead	(7439-92-1)	≤25		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Tin	(7440-31-5)	≤20		2 mg/m^3	2 mg/m^3	4 mg/m^3
Aluminum	(7429-90-5)	≤15	(Dust) (Fume)	-- --	10 mg/m^3 5 mg/m^3	20 mg/m^3 --
Manganese	(7439-96-5)	≤14	(Dust) (Fume)	5 mg/m^3 * --	5 mg/m^3 * 1 mg/m^3	-- 3 mg/m^3
Iron	(1309-37-1)	≤ 6		10 mg/m^3	5 mg/m^3 (as iron oxide fume)	10 mg/m^3
Nickel	(7440-02-0)	≤ 6		1 mg/m^3	1 mg/m^3	--
Zinc	(1314-13-2)	≤ 6	(Dust) (Fume)	-- 5 mg/m^3	(2) 5 mg/m^3 (as zinc oxide)	-- 10 mg/m^3
Silicon	(7440-21-3)	≤ 4		(1)	(2)	20 mg/m^3
Phosphorus	(7723-14-0)	< 2		0.1 mg/m^3	0.1 mg/m^3	0.3 mg/m^3
Antimony	(7440-36-0)	< 1		0.5 mg/m^3	0.5 mg/m^3	--
Arsenic	(7440-38-2)	< 1		0.01 mg/m^3	0.2 mg/m^3	--
Chromium	(7440-47-3)	< 1		1 mg/m^3	0.5 mg/m^3	--
Cobalt	(7440-48-4)	< 1		0.1 mg/m^3	0.1 mg/m^3	--

* Ceiling Limit

(1) <1% quartz, 15 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

(2) <1% quartz, 10 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

Note: Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

C01376

III. PHYSICAL DATA

Melting Point: 999 - 1077° C
Specific Gravity: 7.50 - 9.30
Boiling Point (of copper): 2324° C
Vapor Pressure: 1 mm Hg @ 1628° C (of copper)
Solubility in water: insoluble

Appearance: dependent on composition of scrap metal, processing method used, and existing protective coatings.

IV. FIRE AND EXPLOSION DATA

Flash Point: information not available
Autoignition Temperature: information not available
Flammability Limits: information not available

Bronze scrap itself presents a negligible fire and explosion hazard. A moderate fire and explosion hazard may exist due to contamination, or when the material is finely divided and exposed to heat or flames. Phosphorus dust presents a serious fire and explosion hazard when exposed to heat or oxidizers.

Fire Extinguishing Methods: Use dry chemical or sand. Fire fighters should wear self-contained breathing apparatus and full protective clothing.

V. REACTIVITY DATA

Copper reacts violently with acetylene. Material may also be incompatible with acids, bases, and oxidizers. Dust presents moderate fire and explosion hazards. Molten scrap metal may react violently with water. For additional information, users should consult data sheets on individual component elements.

VI. HEALTH HAZARD DATA

TLV: see Section II.
Primary Routes of Entry: inhalation of dust or fume.

Under normal handling and use, exposure to the massive form of bronze scrap presents few health hazards. Thermal cutting and melting of scrap may produce fumes containing the component elements, and breathing these fumes may present potentially significant health hazards. The exposure levels in Section II are relevant to fumes and dusts. Special precautions should be taken if scrap is contaminated; see Section IX.

Fumes of copper, manganese, and zinc oxide may cause metal fume fever with flu-like symptoms. Copper may cause skin and hair discoloration. Overexposure to dusts and especially fumes containing component elements may cause skin, nose, mouth, and eye irritation and lung changes in workers, potentially leading to pulmonary diseases.

Chromium and nickel compounds have been associated with allergic reactions and rashes, and lung changes. Nickel is a respiratory irritant and can cause pneumonitis. Inhalation of finely divided aluminum powder may cause pulmonary fibrosis. Cobalt is irritating to the eyes and skin and can cause allergic dermatitis, especially in combination with nickel and chromium.

Overexposure to manganese fumes can cause chronic manganese poisoning. Early symptoms include headaches, apathy, sleepiness, and weakness or cramps in the legs. Chronic overexposure can affect the central nervous system, ultimately leading to emotional disturbances, gait and balance difficulties, and paralysis.

Overexposure to antimony may cause gastrointestinal upset and various nervous complaints, such as sleeplessness, irritability, and muscular pains. Inhalation of lead fumes and dusts, or ingestion of lead compounds, can cause lead poisoning, characterized by abdominal pains, joint and muscle pains, or weakness. Prolonged overexposure can cause central nervous system disorders.

Overexposure to arsenic fumes or dusts can lead to arsenic poisoning, characterized by nausea, vomiting, and diarrhea. Prolonged overexposure can lead to liver and kidney damage, central nervous system disorders, and ultimately death. Arsenic can cause skin irritation and allergic reactions.

Overexposure to tin dusts may cause irritation of the skin and mucous membranes, and may result in a benign pneumoconiosis (stannosis). Absorption of large quantities of phosphorus can cause liver damage and necrosis of the jaw.

Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential cancer-causing agents.

FIRST AID:

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Brush off excess dust. Wash area well with soap and water.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical help if large quantities of material have been ingested. (Ingestion of significant amounts of scrap metal is unlikely.)

VII. SPILL PROCEDURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should wear respirators and protective clothing.

Scrap metal can be reclaimed for reuse. Follow Federal, State, and Local regulations regarding disposal.

VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation to keep airborne concentrations of dust or fumes below the TLV. Employees should wear MSHA or NIOSH approved respirators for protection against airborne dust or fumes. Full protective clothing should be worn by workers exposed to heavy concentrations of dust, and showering should be required before changing into street clothes. Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Approved safety glasses or goggles should be worn when working with dusty material. Safety eyewash stations should be provided in close proximity to work areas.

Pre-employment and periodic medical evaluations should be provided. Attention should be directed toward skin, eyes, teeth, respiratory tract, liver, kidneys, blood, pulmonary function, and neurologic health. Chest X-rays should be included if symptoms are present.

Food should not be consumed in the work area.

Special attention is drawn to the requirements of the Occupational Safety and Health Administration standards for lead (29 CFR 1910.1025) and arsenic (29 CFR 1910.1018). State OSHA programs will also have similar requirements.

Special precautions should be taken if scrap is contaminated; see Section IX.

IX. SPECIAL PRECAUTIONS

Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum.

Store material away from incompatible materials, and keep dust away from sources of ignition.

This material is potentially contaminated with coatings, preservatives, oil, and other contaminants. If the material is contaminated, special precautions (such as process control and personal protective equipment, appropriate to the nature of the suspected contaminants) should be taken to avoid resulting exposures when handling, cutting (mechanical or thermal), and/or melting.

Prepared by: Institute of Scrap Iron and Steel (ISIS)
in consultation with JRB Associates

Date Prepared: September 1985

Brass Scrap

MATERIAL SAFETY DATA SHEET

Mason City Iron & Metal Co.
2200 South Pierce
Mason City, Iowa 50401

I. MATERIAL IDENTIFICATION

Manufacturer's Name:
Address:

Telephone Number: 1-515-423-2155

Material Name: Brass Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Copper	(7440-50-8)	≥49	(Dust) (Fume)	1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	2 mg/m^3 --
Zinc	(1314-13-2)	<51	(Dust) (Fume)	-- 5 mg/m^3	(2) 5 mg/m^3 (as zinc oxide)	-- 10 mg/m^3
Manganese	(7439-96-5)	<13	(Dust) (Fume)	5 mg/m^3 * --	5 mg/m^3 * 1 mg/m^3	-- 3 mg/m^3
Lead	(7439-92-1)	≤ 8		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Aluminum	(7429-90-5)	< 8	(Dust) (Fume)	-- --	10 mg/m^3 5 mg/m^3	20 mg/m^3 --
Tin	(7440-31-5)	< 7		2 mg/m^3	2 mg/m^3	4 mg/m^3
Silicon	(7440-21-3)	< 6		(1)	(2)	20 mg/m^3
Iron	(1309-37-1)	≤ 4		10 mg/m^3	5 mg/m^3 (as iron oxide fume)	10 mg/m^3
Nickel	(7440-02-0)	≤ 4		1 mg/m^3	1 mg/m^3	--
Antimony	(7440-36-0)	< 1		0.5 mg/m^3	0.5 mg/m^3	--
Arsenic	(7440-38-2)	< 1		0.01 mg/m^3	0.2 mg/m^3	--
Silver	(7440-22-4)	< 1		0.01 mg/m^3	0.1 mg/m^3	--

* Ceiling Limit

(1) < 1% quartz, 15 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

(2) < 1% quartz, 10 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

Note: antimony trioxide, arsenic, and nickel have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

III. PHYSICAL DATA

Melting Point: 888 - 1066° C
Specific Gravity: 7.70 - 8.86
Boiling Point (of copper): 2324° C

Vapor Pressure: 1 mm Hg @ 1628° C (of copper)
Solubility in water: insoluble

Appearance: dependent on composition of scrap metal, processing method used, and existing protective coatings.

(9/85)

C01377

IV. FIRE AND EXPLOSION DATA

Flash Point: information not available Flammable Limits: information not available
Autoignition Temperature: information not available

Brass scrap itself presents a negligible fire and explosion hazard. A moderate fire and explosion hazard may exist due to contamination, or when the material is finely divided and exposed to heat or flames.

Fire Extinguishing Methods: Use dry chemical or sand. Fire fighters should wear self-contained breathing apparatus and full protective clothing.

V. REACTIVITY DATA

Copper reacts violently with acetylene. Material may also be incompatible with acids, bases, and oxidizers. Dust presents moderate fire and explosion hazards. Molten scrap metal may react violently with water. For additional information, users should consult data sheets on individual component elements.

VI. HEALTH HAZARD DATA

TLV: see Section II.
Primary Routes of Entry: inhalation of dust or fume.

Under normal handling and use, exposure to the massive form of brass scrap presents few health hazards. Thermal cutting and melting of scrap may produce fumes containing the component elements, and breathing these fumes may present potentially significant health hazards. The exposure levels in Section II are relevant to fumes and dusts. Special precautions should be taken if scrap is contaminated; see Section IX.

Fumes of copper, manganese, and zinc oxide may cause metal fume fever with flu-like symptoms. Copper may cause skin and hair discoloration; silver may cause a greyish pigmentation of the skin, and can cause irritation of the skin and mucous membranes. Overexposure to dusts and especially fumes containing component elements may cause skin, nose, mouth, and eye irritation and lung changes in workers, potentially leading to pulmonary diseases.

Nickel compounds have been associated with allergic reactions and rashes, and lung changes. Nickel is a respiratory irritant and can cause pneumonitis. Inhalation of finely divided aluminum powder may cause pulmonary fibrosis.

Overexposure to manganese fumes can cause chronic manganese poisoning. Early symptoms include headaches, apathy, sleepiness, and weakness or cramps in the legs. Chronic overexposure can affect the central nervous system, ultimately leading to emotional disturbances, gait and balance difficulties, and paralysis.

Overexposure to antimony may cause gastrointestinal upset and various nervous complaints, such as sleeplessness, irritability, and muscular pains. Inhalation of lead fumes or dusts, or ingestion of lead compounds, can cause lead poisoning, characterized by abdominal pains, joint and muscle pains, or weakness. Prolonged overexposure can cause central nervous system disorders.

Overexposure to arsenic fumes or dusts can lead to arsenic poisoning, characterized by nausea, vomiting, and diarrhea. Prolonged overexposure can lead to liver and kidney damage, central nervous system disorders, and ultimately death. Arsenic can cause skin irritation and allergic reactions.

Antimony trioxide, arsenic, and nickel have been identified as potential cancer-causing agents.

FIRST AID:

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Brush off excess dust. Wash area well with soap and water.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical help if large quantities of material have been ingested. (Ingestion of significant amounts of scrap metal is unlikely.)

VII. SPILL PROCEDURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should wear respirators and protective clothing.

Scrap metal can be reclaimed for reuse. Follow Federal, State, and Local regulations regarding disposal.

VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation to keep airborne concentrations of dust or fumes below the TLV. Employees should wear MSHA or NIOSH approved respirators for protection against airborne dust or fumes. Full protective clothing should be worn by workers exposed to heavy concentrations of dust, and showering should be required before changing into street clothes. Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Approved safety glasses or goggles should be worn when working with dusty material. Safety eyewash stations should be provided in close proximity to work areas.

Pre-employment and periodic medical evaluations should be provided. Attention should be directed toward skin, eyes, respiratory tract, blood, kidneys, pulmonary function, and neurologic health. Chest X-rays should be included if symptoms are present.

Food should not be consumed in the work area.

Special attention is drawn to the requirements of the Occupational Safety and Health Administration standards for lead (29 CFR 1910.1025) and arsenic (29 CFR 1910.1018). State OSHA programs will also have similar requirements.

Special precautions should be taken if scrap is contaminated; see Section IX.

IX. SPECIAL PRECAUTIONS

Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum. Avoid breathing dust or fumes.

Store material away from incompatible materials, and keep dust away from sources of ignition.

This material is potentially contaminated with coatings, paints, preservatives, cutting oils, and other contaminants. If the material is contaminated, special precautions (such as process control and personal protective equipment, appropriate to the nature of the suspected contaminants) should be taken to avoid resulting exposures when handling, cutting (mechanical or thermal), and/or melting.

Prepared by: Institute of Scrap Iron and Steel (ISIS)
in consultation with JRB Associates

Date Prepared: September 1985

Brass Scrap

MATERIAL SAFETY DATA SHEET

I. MATERIAL IDENTIFICATION

Manufacturer's Name: Kripke Tuschman Industries, Inc. Telephone Number: (419) 537-9400
Address: 2453 Hill Avenue Toledo, Ohio 43607

Material Name: Brass Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Copper	(7440-50-8)	≥49	(Dust)	1 mg/m^3	1 mg/m^3	2 mg/m^3
			(Fume)	0.1 mg/m^3	0.2 mg/m^3	--
Zinc	(1314-13-2)	<51	(Dust)	--	(2)	--
			(Fume)	5 mg/m^3	5 mg/m^3 (as zinc oxide)	10 mg/m^3
Manganese	(7439-96-5)	<13	(Dust)	5 mg/m^3 *	5 mg/m^3 *	--
			(Fume)	--	1 mg/m^3	3 mg/m^3
Lead	(7439-92-1)	≤ 8		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Aluminum	(7429-90-5)	< 8	(Dust)	--	10 mg/m^3	20 mg/m^3
			(Fume)	--	5 mg/m^3	--
Tin	(7440-31-5)	< 7		2 mg/m^3	2 mg/m^3	4 mg/m^3
Silicon	(7440-21-3)	< 6		(1)	(2)	20 mg/m^3
Iron	(1309-37-1)	≤ 4		10 mg/m^3	5 mg/m^3 (as iron oxide fume)	10 mg/m^3
Nickel	(7440-02-0)	≤ 4		1 mg/m^3	1 mg/m^3	--
Antimony	(7440-36-0)	< 1		0.5 mg/m^3	0.5 mg/m^3	--
Arsenic	(7440-38-2)	< 1		0.01 mg/m^3	0.2 mg/m^3	--
Silver	(7440-22-4)	< 1		0.01 mg/m^3	0.1 mg/m^3	--

* Ceiling Limit

(1) < 1% quartz, 15 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

(2) < 1% quartz, 10 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

Note: antimony trioxide, arsenic, and nickel have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

III. PHYSICAL DATA

Melting Point: 888 - 1066° C
Specific Gravity: 7.70 - 8.86
Boiling Point (of copper): 2324° C
Vapor Pressure: 1 mm Hg @ 1628° C (of copper)
Solubility in water: insoluble

Appearance: dependent on composition of scrap metal, processing method used, and existing protective coatings.

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IV. FIRE AND EXPLOSION DATA

Flash Point: information not available Flammable Limits: information not available
Autoignition Temperature: information not available

Brass scrap itself presents a negligible fire and explosion hazard. A moderate fire and explosion hazard may exist due to contamination, or when the material is finely divided and exposed to heat or flames.

Fire Extinguishing Methods: Use dry chemical or sand. Fire fighters should wear self-contained breathing apparatus and full protective clothing.

V. REACTIVITY DATA

Copper reacts violently with acetylene. Material may also be incompatible with acids, bases, and oxidizers. Dust presents moderate fire and explosion hazards. Molten scrap metal may react violently with water. For additional information, users should consult data sheets on individual component elements.

VI. HEALTH HAZARD DATA

TLV: see Section II.
Primary Routes of Entry: inhalation of dust or fume.

Under normal handling and use, exposure to the massive form of brass scrap presents few health hazards. Thermal cutting and melting of scrap may produce fumes containing the component elements, and breathing these fumes may present potentially significant health hazards. The exposure levels in Section II are relevant to fumes and dusts. Special precautions should be taken if scrap is contaminated; see Section IX.

Fumes of copper, manganese, and zinc oxide may cause metal fume fever with flu-like symptoms. Copper may cause skin and hair discoloration; silver may cause a greyish pigmentation of the skin, and can cause irritation of the skin and mucous membranes. Overexposure to dusts and especially fumes containing component elements may cause skin, nose, mouth, and eye irritation and lung changes in workers, potentially leading to pulmonary diseases.

Nickel compounds have been associated with allergic reactions and rashes, and lung changes. Nickel is a respiratory irritant and can cause pneumonitis. Inhalation of finely divided aluminum powder may cause pulmonary fibrosis.

Overexposure to manganese fumes can cause chronic manganese poisoning. Early symptoms include headaches, apathy, sleepiness, and weakness or cramps in the legs. Chronic overexposure can affect the central nervous system, ultimately leading to emotional disturbances, gait and balance difficulties, and paralysis.

Overexposure to antimony may cause gastrointestinal upset and various nervous complaints, such as sleeplessness, irritability, and muscular pains. Inhalation of lead fumes or dusts, or ingestion of lead compounds, can cause lead poisoning, characterized by abdominal pains, joint and muscle pains, or weakness. Prolonged overexposure can cause central nervous system disorders.

Overexposure to arsenic fumes or dusts can lead to arsenic poisoning, characterized by nausea, vomiting, and diarrhea. Prolonged overexposure can lead to liver and kidney damage, central nervous system disorders, and ultimately death. Arsenic can cause skin irritation and allergic reactions.

Antimony trioxide, arsenic, and nickel have been identified as potential cancer-causing agents.

FIRST AID:

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Brush off excess dust. Wash area well with soap and water.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical help if large quantities of material have been ingested. (Ingestion of significant amounts of scrap metal is unlikely.)

VII. SPILL PROCEDURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should wear respirators and protective clothing.

Scrap metal can be reclaimed for reuse. Follow Federal, State, and Local regulations regarding disposal.

VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation to keep airborne concentrations of dust or fumes below the TLV. Employees should wear MSHA or NIOSH approved respirators for protection against airborne dust or fumes. Full protective clothing should be worn by workers exposed to heavy concentrations of dust, and showering should be required before changing into street clothes. Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Approved safety glasses or goggles should be worn when working with dusty material. Safety eyewash stations should be provided in close proximity to work areas.

Pre-employment and periodic medical evaluations should be provided. Attention should be directed toward skin, eyes, respiratory tract, blood, kidneys, pulmonary function, and neurologic health. Chest X-rays should be included if symptoms are present.

Food should not be consumed in the work area.

Special attention is drawn to the requirements of the Occupational Safety and Health Administration standards for lead (29 CFR 1910.1025) and arsenic (29 CFR 1910.1018). State OSHA programs will also have similar requirements.

Special precautions should be taken if scrap is contaminated; see Section IX.

IX. SPECIAL PRECAUTIONS

Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum. Avoid breathing dust or fumes.

Store material away from incompatible materials, and keep dust away from sources of ignition.

This material is potentially contaminated with coatings, paints, preservatives, cutting oils, and other contaminants. If the material is contaminated, special precautions (such as process control and personal protective equipment, appropriate to the nature of the suspected contaminants) should be taken to avoid resulting exposures when handling, cutting (mechanical or thermal), and/or melting.

Prepared by: Institute of Scrap Iron and Steel (ISIS)
in consultation with JRB Associates

Date Prepared: September 1985

MATERIAL SAFETY DATA SHEET

I. MATERIAL IDENTIFICATION

Manufacturer's Name: Kripke Tuschman Industries, Inc.
Address: 2453 Hill Avenue Toledo, Ohio 43607 Telephone Number: (419) 537-9400

Material Name: Bronze Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Copper	(7440-50-8)	>66	(Dust)	1 mg/m^3	1 mg/m^3	2 mg/m^3
			(Fume)	0.1 mg/m^3	0.2 mg/m^3	--
Lead	(7439-92-1)	≤25		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Tin	(7440-31-5)	≤20		2 mg/m^3	2 mg/m^3	4 mg/m^3
Aluminum	(7429-90-5)	≤15	(Dust)	--	10 mg/m^3	20 mg/m^3
			(Fume)	--	5 mg/m^3	--
Manganese	(7439-96-5)	≤14	(Dust)	5 mg/m^3 *	5 mg/m^3 *	--
			(Fume)	--	1 mg/m^3	3 mg/m^3
Iron	(1309-37-1)	≤ 6		10 mg/m^3	5 mg/m^3 (as iron oxide fume)	10 mg/m^3
Nickel	(7440-02-0)	≤ 6		1 mg/m^3	1 mg/m^3	--
Zinc	(1314-13-2)	≤ 6	(Dust)	--	(2)	--
			(Fume)	5 mg/m^3	5 mg/m^3 (as zinc oxide)	10 mg/m^3
Silicon	(7440-21-3)	≤ 4		(1)	(2)	20 mg/m^3
Phosphorus	(7723-14-0)	< 2		0.1 mg/m^3	0.1 mg/m^3	0.3 mg/m^3
Antimony	(7440-36-0)	< 1		0.5 mg/m^3	0.5 mg/m^3	--
Arsenic	(7440-38-2)	< 1		0.01 mg/m^3	0.2 mg/m^3	--
Chromium	(7440-47-3)	< 1		1 mg/m^3	0.5 mg/m^3	--
Cobalt	(7440-48-4)	< 1		0.1 mg/m^3	0.1 mg/m^3	--

* Ceiling Limit

(1) <1% quartz, 15 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

(2) <1% quartz, 10 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

Note: Antimony trioxide, arsenic, chromium, cobalt-chromium alloy, and nickel have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

(9/85)

P & W INDUSTRIES, INC.
P. O. BOX [illegible]
COVINGTON, LA [illegible]

MATERIAL SAFETY DATA SHEET

Brass Scrap

I. MATERIAL IDENTIFICATION

Manufacturer's Name: Telephone Number:
Address:

Material Name: Brass Scrap

II. HAZARDOUS INGREDIENTS

	CAS Number	%		OSHA 8-hr TWA	ACGIH 8-hr TWA (1984-85)	ACGIH STEL (1984-85)
Copper	(7440-50-8)	≥49	(Dust) (Fume)	1 mg/m^3 0.1 mg/m^3	1 mg/m^3 0.2 mg/m^3	2 mg/m^3 --
Zinc	(1314-13-2)	<51	(Dust) (Fume)	-- 5 mg/m^3	(2) 5 mg/m^3 (as zinc oxide)	-- 10 mg/m^3
Manganese	(7439-96-5)	<13	(Dust) (Fume)	5 mg/m^3 * --	5 mg/m^3 * 1 mg/m^3	-- 3 mg/m^3
Lead	(7439-92-1)	≤ 8		0.05 mg/m^3	0.15 mg/m^3	0.45 mg/m^3
Aluminum	(7429-90-5)	< 8	(Dust) (Fume)	-- --	10 mg/m^3 5 mg/m^3	20 mg/m^3 --
Tin	(7440-31-5)	< 7		2 mg/m^3	2 mg/m^3	4 mg/m^3
Silicon	(7440-21-3)	< 6		(1)	(2)	20 mg/m^3
Iron	(1309-37-1)	≤ 4		10 mg/m^3	5 mg/m^3 (as iron oxide fume)	10 mg/m^3
Nickel	(7440-02-0)	≤ 4		1 mg/m^3	1 mg/m^3	--
Antimony	(7440-36-0)	< 1		0.5 mg/m^3	0.5 mg/m^3	--
Arsenic	(7440-38-2)	< 1		0.01 mg/m^3	0.2 mg/m^3	--
Silver	(7440-22-4)	< 1		0.01 mg/m^3	0.1 mg/m^3	--

* Ceiling Limit

(1) < 1% quartz, 15 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

(2) < 1% quartz, 10 mg/m^3 of total dust or 5 mg/m^3 respirable dust.

Note: antimony trioxide, arsenic, and nickel have been identified as potential human carcinogens. See Section VI, Health Hazard Data.

III. PHYSICAL DATA

Melting Point: 888 - 1066° C
Specific Gravity: 7.70 - 8.86
Boiling Point (of copper): 2324° C

Vapor Pressure: 1 mm Hg @ 1628° C (of copper)
Solubility in water: insoluble

Appearance: dependent on composition of scrap metal, processing method used, and existing protective coatings.

(9/85)

C01379

IV. FIRE AND EXPLOSION DATA

Flash Point: information not available Flammable Limits: information not available
Autoignition Temperature: information not available

Brass scrap itself presents a negligible fire and explosion hazard. A moderate fire and explosion hazard may exist due to contamination, or when the material is finely divided and exposed to heat or flames.

Fire Extinguishing Methods: Use dry chemical or sand. Fire fighters should wear self-contained breathing apparatus and full protective clothing.

V. REACTIVITY DATA

Copper reacts violently with acetylene. Material may also be incompatible with acids, bases, and oxidizers. Dust presents moderate fire and explosion hazards. Molten scrap metal may react violently with water. For additional information, users should consult data sheets on individual component elements.

VI. HEALTH HAZARD DATA

TLV: see Section II.
Primary Routes of Entry: inhalation of dust or fume.

Under normal handling and use, exposure to the massive form of brass scrap presents few health hazards. Thermal cutting and melting of scrap may produce fumes containing the component elements, and breathing these fumes may present potentially significant health hazards. The exposure levels in Section II are relevant to fumes and dusts. Special precautions should be taken if scrap is contaminated; see Section IX.

Fumes of copper, manganese, and zinc oxide may cause metal fume fever with flu-like symptoms. Copper may cause skin and hair discoloration; silver may cause a greyish pigmentation of the skin, and can cause irritation of the skin and mucous membranes. Overexposure to dusts and especially fumes containing component elements may cause skin, nose, mouth, and eye irritation and lung changes in workers, potentially leading to pulmonary diseases.

Nickel compounds have been associated with allergic reactions and rashes, and lung changes. Nickel is a respiratory irritant and can cause pneumonitis. Inhalation of finely divided aluminum powder may cause pulmonary fibrosis.

Overexposure to manganese fumes can cause chronic manganese poisoning. Early symptoms include headaches, apathy, sleepiness, and weakness or cramps in the legs. Chronic overexposure can affect the central nervous system, ultimately leading to emotional disturbances, gait and balance difficulties, and paralysis.

Overexposure to antimony may cause gastrointestinal upset and various nervous complaints, such as sleeplessness, irritability, and muscular pains. Inhalation of lead fumes or dusts, or ingestion of lead compounds, can cause lead poisoning, characterized by abdominal pains, joint and muscle pains, or weakness. Prolonged overexposure can cause central nervous system disorders.

Overexposure to arsenic fumes or dusts can lead to arsenic poisoning, characterized by nausea, vomiting, and diarrhea. Prolonged overexposure can lead to liver and kidney damage, central nervous system disorders, and ultimately death. Arsenic can cause skin irritation and allergic reactions.

Antimony trioxide, arsenic, and nickel have been identified as potential cancer-causing agents.

FIRST AID:

Eye Contact:	Flush well with running water to remove particulate. Get medical attention.
Skin Contact:	Brush off excess dust. Wash area well with soap and water.
Inhalation:	Remove to fresh air. Get medical attention.
Ingestion:	Seek medical help if large quantities of material have been ingested. (Ingestion of significant amounts of scrap metal is unlikely.)

VII. SPILL PROCEDURES

No special precautions are necessary for spills of bulk material. If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should wear respirators and protective clothing.

Scrap metal can be reclaimed for reuse. Follow Federal, State, and Local regulations regarding disposal.

VIII. SPECIAL PROTECTION INFORMATION

Use general and local exhaust ventilation to keep airborne concentrations of dust or fumes below the TLV. Employees should wear MSHA or NIOSH approved respirators for protection against airborne dust or fumes. Full protective clothing should be worn by workers exposed to heavy concentrations of dust, and showering should be required before changing into street clothes. Gloves and barrier creams may be necessary to prevent skin sensitization and dermatitis.

Approved safety glasses or goggles should be worn when working with dusty material. Safety eyewash stations should be provided in close proximity to work areas.

Pre-employment and periodic medical evaluations should be provided. Attention should be directed toward skin, eyes, respiratory tract, blood, kidneys, pulmonary function, and neurologic health. Chest X-rays should be included if symptoms are present.

Food should not be consumed in the work area.

Special attention is drawn to the requirements of the Occupational Safety and Health Administration standards for lead (29 CFR 1910.1025) and arsenic (29 CFR 1910.1018). State OSHA programs will also have similar requirements.

Special precautions should be taken if scrap is contaminated; see Section IX.

IX. SPECIAL PRECAUTIONS

Use good housekeeping practices to prevent accumulations of dust and to keep airborne dust concentrations at a minimum. Avoid breathing dust or fumes.

Store material away from incompatible materials, and keep dust away from sources of ignition.

This material is potentially contaminated with coatings, paints, preservatives, cutting oils, and other contaminants. If the material is contaminated, special precautions (such as process control and personal protective equipment, appropriate to the nature of the suspected contaminants) should be taken to avoid resulting exposures when handling, cutting (mechanical or thermal), and/or melting.

Prepared by: Institute of Scrap Iron and Steel (ISIS)
in consultation with JRB Associates

Date Prepared: September 1985

Date: July 1, 1978

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

27
Berkeley
120 Mesh
Supersil

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
Pennsylvania Glass Sand Corporation	304-258-2500

ADDRESS (Number, Street, City, State, and ZIP Code)
P. O. Box 187, Berkeley Springs, West Virginia 25411

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Silicon Dioxide;Crystalline Silica;Quartz;Silica Sand	Berkeley 120 Mesh Supersil

CHEMICAL FAMILY	FORMULA
Natural Mineral, extracted from earth	SiO_2 (99.70% Free Silica)

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS		%	TLV (Units)	ALLOYS AND METALLIC COATINGS		%	TLV (Units)
PIGMENTS	None			BASE METAL	None		
CATALYST	None			ALLOYS	None		
VEHICLE	None			METALLIC COATINGS	None		
SOLVENTS	None			FILLER METAL PLUS COATING OR CORE FLUX	None		
ADDITIVES	None			OTHERS	None		
OTHERS	None						

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
None		

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	4,046	SPECIFIC GRAVITY (H_2O=1)	2.65
VAPOR PRESSURE (mm Hg.)	N.A.	PERCENT, VOLATILE BY VOLUME (%)	None
VAPOR DENSITY (AIR=1)	N.A.	EVAPORATION RATE (_____=1)	None
SOLUBILITY IN WATER	Negligible		

APPEARANCE AND ODOR Sand - granular, crushed or ground like flour - No odor or taste

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
N.A.	N.A.		

EXTINGUISHING MEDIA: No fire or explosive hazard

SPECIAL FIRE FIGHTING PROCEDURES: N.A.

UNUSUAL FIRE AND EXPLOSION HAZARDS: N.A.

NOTE: N.A. - Not Applicable

C01380

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SECTION V - HEALTH HAZARD DATA See NOTE Below

THRESHOLD LIMIT VALUE: As specified in OSHA Standard currently 29 CFR 1910.1000, Table Z-3 for silica:crystalline:quartz

EFFECTS OF OVEREXPOSURE: Repeated inhalation of respirable free silica dust may cause delayed lung injury (Silicosis) which is an occupational disease.

EMERGENCY AND FIRST AID PROCEDURES: None

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATIBILITY *(Materials to avoid)*: Dissolved by Hydrofluoric Acid (HF) which can result

HAZARDOUS DECOMPOSITION PRODUCTS: in Silicon Tetrafluoride (SiF_4) which is a corrosive gas

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES See NOTE Below

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Clean up by use of recommended dustless methods - water or vacuum - Limit exposure so that it does not exceed OSHA Standard TLV. (See 29 CFR 1910.1000, Table Z-3); Avoid dry sweeping.

WASTE DISPOSAL METHOD: Any approved solid waste disposal method - Limit exposure so that it does not exceed OSHA Standard TLV.

SECTION VIII - SPECIAL PROTECTION INFORMATION See NOTE Below

RESPIRATORY PROTECTION *(Specify type)*: Dust respirator in compliance with OSHA Standard currently 29 CFR 1910.134

VENTILATION	LOCAL EXHAUST: Follow OSHA Standard 29 CFR 1910.94	SPECIAL: Abrasive Blasting - See 29 CFR 1910.94(a) for OSHA Standard
Yes	MECHANICAL *(General)*: Follow OSHA Standard 29 CFR 1910.94	

PROTECTIVE GLOVES: Optional	EYE PROTECTION: Recommended

OTHER PROTECTIVE EQUIPMENT: As required to meet applicable OSHA Standards

SECTION IX - SPECIAL PRECAUTIONS See NOTE Below

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Use dustless systems for handling, storage and clean-up so that exposure does not exceed OSHA Standard TLV. Use adequate ventilation and dust collection.

OTHER PRECAUTIONS: Practice Good Housekeeping; Maintain and test respirators, ventilation and dust collection equipment; WARN your employees (and your customer-users in case of resale) by posting, and other means, of the hazard and OSHA precautions to be used.

NOTE: Follow OSHA Standards as they may presently exist or as hereafter amended, modified or adopted. See 29 CFR Part 1910.

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VALLEY FORGE, PA 19482

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(415) 229-3050—Martinez, CA
(713) 944-1924—So. Houston, TX
(414) 258-6970—West Allis, WI

CARBON DIOXIDE
MATERIAL SAFETY DATA SHEET

PRODUCT NAME	CAS #
Carbon Dioxide	124-38-9
TRADE NAME AND SYNONYMS	DOT I.D. No.:
Carbon Dioxide; Carbonic Anhydride	UN 1013
CHEMICAL NAME AND SYNONYMS	DOT Hazard Class:
Carbon Dioxide	Nonflammable gas
ISSUE DATE AND REVISIONS	Formula:
25 November 1985	CO_2
	Chemical Family:
	Carbonate

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT 5,000 Molar PPM. Its STEL is proposed to be changed from 15,000 Molar PPM to 30,000 Molar PPM (ACGIH, 1985-86). OSHA (1985) TWA = 5,000 Molar PPM.

SYMPTOMS OF EXPOSURE

Inhalation: Low concentrations (3-5 molar %) cause increased respiration and headache.

Eight to 15 molar % concentrations cause headache, nausea and vomiting which may lead to unconsciousness if not moved to open air or given oxygen.

Higher concentrations cause rapid circulatory insufficiency leading to coma and death.

TOXICOLOGICAL PROPERTIES

Carbon dioxide is the most powerful cerebral vasodilator known. Inhaling large concentrations causes rapid circulatory insufficiency leading to coma and death. Chronic, harmful effects are not known from repeated inhalation of low (3-5 molar %) concentrations.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO CARBON DIOXIDE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Assure that vomited material does not obstruct the airway by use of positional drainage. Further treatment should be symptomatic and supportive.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Forms carbonic acid in the presence of water.

PHYSICAL DATA

BOILING POINT Sublimation point = -109.3°F (-78.5°C)	LIQUID DENSITY AT BOILING POINT Solid Density = 97.5 lb/ft^3 (1562 kg/m^3)
VAPOR PRESSURE @ 70°F (21.1°C): 856 psia (5900 kPa)	GAS DENSITY AT 70°F, 1 atm .124 lb/ft^3 (1.99 kg/m^3)
SOLUBILITY IN WATER Very soluble	FREEZING POINT -69.8°F (-56.6°C) @ 75.1 psia (518 kPa)
EVAPORATION RATE N/A	SPECIFIC GRAVITY (AIR=1) @ 70°F (21.1°C) = 1.65
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMAGLE LIMITS % BY VOLUME LEL N/A UEL N/A
EXTINGUISHING MEDIA Nonflammable, inert gas		ELECTRICAL CLASSIFICATION Nonhazardous
SPECIAL FIRE FIGHTING PROCEDURES N/A		
UNUSUAL FIRE AND EXPLOSION HAZARDS N/A		

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		N/A
Stable	X	

INCOMPATIBILITY (Materials to avoid): None

HAZARDOUS DECOMPOSITION PRODUCTS: Carbon Monoxide

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		N/A
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION See Local Exhaust	LOCAL EXHAUST To prevent accumulation above the TWA.	SPECIAL N/A
	MECHANICAL (Gen.) N/A	OTHER N/A
PROTECTIVE GLOVES Any material		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Carbon Dioxide
DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas
I.D. No.: UN 1013

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<1500 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-1, G-6, G-6.1, and G-6.2.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, G-6, G-6.1, and G-6.2.

SPECIAL PACKAGING RECOMMENDATIONS

Dry carbon dioxide can be handled with most common structural materials. Moist carbon dioxide is corrosive by its formation of carbonic acid. For these applications, 316, 309 and 310 stainless steels may be used as well as Hastelloy® A, B & C and Monel®. Ferrous nickel alloys are slightly corroded.

At normal temperatures carbon dioxide is compatible with most plastics and elastomers.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

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(414) 258-8970—West Allis, WI

CARBON DIOXIDE-OXYGEN USP MIXTURE

MATERIAL SAFETY DATA SHEET

PRODUCT NAME Carbon dioxide-oxygen USP mixture	CAS # For carbon dioxide = 124-38-9; For oxygen = 7782-44-7
TRADE NAME AND SYNONYMS Carbon dioxide-oxygen USP mixture	DOT I.D. No.: UN 1014
CHEMICAL NAME AND SYNONYMS Carbon dioxide-oxygen USP mixture	DOT Hazard Class: Nonflammable gas
ISSUE DATE AND REVISIONS 25 November 1985	Formula: CO_2-O_2 mixture
	Chemical Family: Gas mixture

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

The TWA for carbon dioxide is 5,000 molar PPM. Its STEL is proposed to be changed from 15,000 molar PPM to 30,000 molar PPM (ACGIH, 1985-86). OSHA (1985) TWA for carbon dioxide = 5,000 molar PPM. Please see WARNING statement on last page.

SYMPTOMS OF EXPOSURE

Breathing mixtures with high oxygen concentrations (greater than 75 molar percent) causes symptoms of hyperoxia which include cramps, nausea, dizziness, hypothermia, ambylopia, respiratory difficulties, bradycardia, fainting spells and convulsions capable of leading to death. For additional data on hyperoxia, refer to Compressed Gas Association's Pamphlet P-14. The carbon dioxide present in the mixture should cause the respiration rate to be increased.

TOXICOLOGICAL PROPERTIES

The property is that of hyperoxia which leads to pneumonia. Concentrations between 25 and 75 molar percent present a risk of inflammation of organic matter in the body.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO OXYGEN. RESCUE PERSONNEL SHOULD BE COGNIZANT OF EXTREME FIRE HAZARD ASSOCIATED WITH OXYGEN-RICH ATMOSPHERES.

Conscious persons should be assisted to an uncontaminated area and breathe fresh air. They should be kept warm and quiet. The physician should be informed that the victim is experiencing (has experienced) hyperoxia.

Unconscious persons should be moved to an uncontaminated area and given assisted respiration. When breathing has been restored, treatment should be as above. Continued treatment should be symptomatic and supportive.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

This oxygen-rich mixture will vigorously accelerate combustion. Contact with all flammable material should be avoided. Some materials which are not flammable in air will burn in oxygen-enriched atmospheres.

PHYSICAL DATA (See Note on Last Page.)

BOILING POINT Gas mixture	LIQUID DENSITY AT BOILING POINT Gas mixture
VAPOR PRESSURE Gas mixture	GAS DENSITY AT 70°F, 1 atm Gas mixture
SOLUBILITY IN WATER Gas mixture	FREEZING POINT Gas mixture
EVAPORATION RATE Gas mixture	SPECIFIC GRAVITY (AIR=1) @ 70°F (21.1°C) = greater than 1.0
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMAGLE LIMITS % BY VOLUME LEL N/A UEL N/A
EXTINGUISHING MEDIA Copious quantities of water for fires with oxygen as the oxidizer.		ELECTRICAL CLASSIFICATION Nonhazardous

SPECIAL FIRE FIGHTING PROCEDURES

If possible, stop the flow of the carbon dioxide-oxygen mixture which is supporting the fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Vigorously accelerates combustion.

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		N/A
Stable	X	

INCOMPATIBILITY (Materials to avoid)

All flammable material

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		N/A
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)		
N/A		
VENTILATION	LOCAL EXHAUST	SPECIAL
See last page.	See last page.	N/A
	MECHANICAL (Gen.)	OTHER
	N/A	N/A
PROTECTIVE GLOVES		
As required; any material		
EYE PROTECTION		
Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT		
Safety shoes, safety shower		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Carbon Dioxide-Oxygen Mixture DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1014

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinder. Use a suitable and hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-1, P-2, P-14, G-4 and G-6.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits and away from full or empty stored cylinders which contain flammable products. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, P-2, P-14, G-4, and G-6.

SPECIAL PACKAGING RECOMMENDATIONS

Carbon steels and low alloy steels are acceptable for use at lower pressures. For high pressure applications use stainless steels, copper and its alloys, nickel and its alloys, brass, bronze, silicon alloys, Monel® , Inconel© or beryllium. Lead and silver or lead and tin alloys are good gasketing materials. Teflon® and Kel-F® are the preferred non-metal gaskets.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Equipment to contain high oxygen content mixtures must be "cleaned for oxygen service." See Compressed Gas Association Pamphlet G-4.1. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

WARNING: Administration of carbon dioxide-oxygen mixtures may be hazardous or contra-indicated. For use only by or under the supervision of a licensed practitioner who is experienced in the use and administration of carbon dioxide-oxygen mixtures and is familiar with the indications, effects, dosages, methods, frequency, duration of administration, hazards, contraindications, side effects, and precautions to be taken.

The concentration of each component in the mixture in molar percent is shown on the label on the cylinder. DO NOT USE THE PRODUCT IF THE COMPONENT CONCENTRATION DATA IS NOT CLEARLY LEGIBLE ON THE CYLINDER LABEL.

PHYSICAL DATA: (Continued)

Note: For physical properties of the pure gases, see your supplier's material safety data sheets for oxygen and carbon dioxide.

VENTILATION: (Continued)

To prevent accumulation above 25 molar percent oxygen or above the TWA for carbon dioxide.

LOCAL EXHAUST: (Continued)

To prevent accumulation above 25 molar percent oxygen or above the TWA for carbon dioxide.

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(414) 258-6970—West Allis, WI

8-25% CARBON DIOXIDE IN ARGON
MATERIAL SAFETY DATA SHEET

PRODUCT NAME 8-25% Carbon Dioxide in Argon	CAS # For Carbon Dioxide = 124-38-9 For Argon = 7440-37-1
TRADE NAME AND SYNONYMS 8-25% Carbon Dioxide in Argon	DOT I.D. No.: UN 1956
CHEMICAL NAME AND SYNONYMS 8-25% Carbon Dioxide in Argon	DOT Hazard Class: Nonflammable gas
ISSUE DATE AND REVISIONS 25 November 1985	Formula 8-25 Molar % CO_2 in Ar
	Chemical Family: Gas mixture

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT These gas mixtures contain varying quantities of gaseous carbon dioxide. Carbon dioxide has a TWA of 5,000 molar PPM. Its STEL is proposed
(Continued on last page.)

SYMPTOMS OF EXPOSURE

Concentrations of 20-30 percent of these mixtures when inhaled with adequate oxygen in the air will cause an increase in the respiratory rate. Higher concentrations will cause headache, nausea and eventual unconsciousness.

TOXICOLOGICAL PROPERTIES

Carbon dioxide is the most powerful vasodilator known. Inhaling large concentrations causes rapid circulatory insufficiency leading to coma and death. Chronic harmful effects are not known from repeated inhalation of low (20-30%) concentrations of these mixtures.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO THESE MIXTURES. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

None

PHYSICAL DATA (See Note on Last Page.)

BOILING POINT Gas mixture	LIQUID DENSITY AT BOILING POINT Gas mixture
VAPOR PRESSURE Gas mixture	GAS DENSITY AT 70°F. 1 atm Gas mixture
SOLUBILITY IN WATER Gas mixture	FREEZING POINT Gas mixture
EVAPORATION RATE Gas mixture	SPECIFIC GRAVITY (AIR=1) @ 70°F (21.1°C) = Greater than 1.4
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMAGLE LIMITS % BY VOLUME LEL N/A UEL N/A
EXTINGUISHING MEDIA Nonflammable gas mixture		ELECTRICAL CLASSIFICATION Nonhazardous

SPECIAL FIRE FIGHTING PROCEDURES

N/A

UNUSUAL FIRE AND EXPLOSION HAZARDS

N/A

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		N/A
Stable	X	

INCOMPATIBILITY (Materials to avoid)
None

HAZARDOUS DECOMPOSITION PRODUCTS
None

HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		N/A
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD Do not dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.

VENTILATION	LOCAL EXHAUST	SPECIAL
See Local Exhaust on last page.	See last page.	N/A
	MECHANICAL (Gen.) N/A	OTHER N/A

PROTECTIVE GLOVES

As required when welding

EYE PROTECTION

Safety goggles or glasses

OTHER PROTECTIVE EQUIPMENT

Safety shoes and appropriate head and eye protection when welding

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Compressed gas, n.o.s. DOT Hazard Class: Nonflammable gas
DOT Shipping Label: Nonflammable gas I.D. No.: UN 1956

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-1, P-14 and Safety Bulletin SB-2.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in-first out" inventory system to prevent full cylinders being stored for excessive periods of time.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, P-14 and Safety Bulletin SB-2.

SPECIAL PACKAGING RECOMMENDATIONS

These gas mixtures are noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Analytical monitoring for carbon dioxide levels in the work atmosphere is recommended if these mixtures are used in confined areas. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

to be changed from 15,000 molar PPM to 30,000 molar PPM (ACGIH, 1985-86). OSHA (1985) TWA for carbon dioxide = 5,000 molar PPM.

PHYSICAL DATA: (Continued)

For physical data of the pure gases, see your supplier's material safety data sheets for carbon dioxide and argon.

LOCAL EXHAUST: (Continued)

To prevent accumulation above the TWA for carbon dioxide.

Castables, Fireclay and Heavy Weight

MATERIAL SAFETY DATA SHEET

J.H. FRANCE REFRACTORIES CO.

SNOW SHOE, PA 16874

TELEPHONE 814-387-6811

Date Prepared:
Nov. 19, 1985

Date Revised:

General Classification of Product: CASTABLES — FIRECLAY, HEAVY WEIGHT

Trade Name/Synonym of Product:

HYDRECON 186A
HYDRECON 186ES & LOW IRON
HYDRECON CG54 & LOW IRON
HYDRECON S
HYDRECON PLASTER
LADLECON
HYDRECON 5
HYDRECON 2800
HYDRECON 3000
HYDRECON 3000N
HYDRECON CFC-570
HYDRECON 3100
HYDRECON 3200
HYDRECON 3200-60
HYDRECON 3200-LCV
HYDRECON 3200-S
HYDRECON 3200-LCVS
HYDRECON AR-19
HYDRECON TE-3 and 4

Hazardous Ingredients — Section I

Ingredient	CAS Number
Crystalline Silica	7631-86-9
Cement Binder	65997-16-2

Physical Data — Section II

Appearance & Color
White to gray granular powder

Odor & Solubility
Odorless, -insoluble in water, but mixes well
-soluble in HF and most strong acids

Fire & Explosion Data — Section III

This material is noncombustible. Use extinguishing media appropriate to surrounding area.

Health Hazard Data — Section IV

Inhalation of all dusts are hazardous. Crystalline silica when inhaled may cause silicosis. This is a chronic slowly developing lung disease. The cement binder may cause eye and skin burns.

Reactivity — Section V

This material is stable under ordinary conditions.

Emergency and First Aid Procedures — Section VI

Terminate exposure. Flush affected eyes and skin with water. Consult with a physician where felt necessary.

Spill, Leak, and Disposal — Section VII

Avoid inhalation of all dusts. Protect eyes and skin. Consult with local, state, and federal authorities on waste removal regulations.

Special Protection Information — Section VIII

Wear NIOSH approved safety masks, eye glasses, and gloves. Ventilate where necessary.

Special Precautions and Comments — Section IX

Consult with manufacturer on curing, drying, and firing instructions.

Prepared By: I. Dulberg

Title: Technical Manager

Castables, Gun Mixes

MATERIAL SAFETY DATA SHEET

J.H. FRANCE REFRACTORIES CO.

SNOW SHOE, PA 16874

TELEPHONE 814-387-6811

Date Prepared:
Nov. 19, 1985

Date Revised:

General Classification of Product: CASTABLE, GUN MIXES

Trade Name/Synonym of Product:

HYDRECON 186ES, GM
HYDRECON 981, GM
PHA 1012, GM
SPARTAN 90, GM
FRANCO LITE 21, GM
FRANCO LITE 30, GM, LOW IRON
LT. WT. HYDRECON 512-2000 GM
LT. WT. HYDRECON 2200 GM
LT. WT. HYDRECON 2400 GM
LT. WT. HYDRECON 56-2750 GM
HYDRECON TABCAST, GM
LT. WT. HYDRECON 2900 GM,
LT. WT. HYDRECON CLW 1001, GM
HYDRECON CFC 882, GM
LT. WT. HYDRECON CLW 989, GM
HYDRECON 186 ES, GM, LI
CFC 570/809 GM
CFC 570, Fast Set GM
HYDRECON 5 GM
HYDRECON 3000 GM
HYDRECON 3100 GM
ANDALU CAST GM
HYDRECON AR 19 GM
HYDRECON 3200 GM

Hazardous Ingredients — Section I

Ingredient	CAS Number
Crystalline Silica	7631-86-9
Cement Binder	65997-16-2

Physical Data — Section II

Appearance & Color
White to Grey granular powder

Odor & Solubility
Odorless, -insoluble in water but mixes well
-soluble in HF and most strong acids

Fire & Explosion Data — Section III

This material is noncombustible. Use extinguishing media appropriate to surrounding area.

Health Hazard Data — Section IV

Inhalation of all dusts are hazardous. Crystalline silica when inhaled may cause silicosis. This is a chronic slowly developing lung disease. Cement binder may cause eye and skin burns.

Reactivity — Section V

This material is stable under ordinary conditions.

Emergency and First Aid Procedures — Section VI

Terminate exposure. If affected, consult a physician. Flush eyes and skin with water.

Spill, Leak, and Disposal — Section VII

Avoid inhalation of all dusts. Protect eyes and skin. Consult with local, state, and federal authorities on waste removal regulations.

Special Protection Information — Section VIII

Wear NIOSH approved safety masks, eye glasses, and gloves. Ventilate where necessary.

Special Precautions and Comments — Section IX

Consult with manufacturer for curing, drying, and firing instructions.

Prepared By: I. Dulberg

Title: Technical Manager

Although reasonable care has been taken in the preparation of this MSDS, J. H. France Refractories Co. extends no warrantees, makes no representation and assumes no responsibilities as to the accuracy or suitability of such information for application to the purchaser's intended purposes or for consequences of its use.

Castables, High Alumina Heavy Weight

MATERIAL SAFETY DATA SHEET

J.H. FRANCE REFRACTORIES CO.

SNOW SHOE, PA 16874

TELEPHONE 814-387-6811

Date Prepared:
Nov. 19, 1985

Date Revised:

General Classification of Product: CASTABLES, HIGH ALUMINA, HEAVY WEIGHT

Trade Name/Synonym of Product:

HYDRECON 70
HYDRECON 85
HYDRECON TABCAST
ANDALU CAST
HYDRECON TABCAST LCV
ANDALU CAST LCV
*HYDRECON CHROMAL LCV (C/A)
*HYDRECON C/A

Hazardous Ingredients — Section I

Ingredient	CAS Number
Crystalline Silica	7631-86-9
*Chrome Oxide	1308-38-9
Cement Binder	65997-16-2

Physical Data — Section II

Appearance & Color
White to Grey granular powder

Odor & Solubility
Odorless, -insoluble in water but mixes well
-soluble in HF and most strong acids

Fire & Explosion Data — Section III

This material is noncombustible. Consult with manufacturer on curing, drying, and firing instructions.

Health Hazard Data — Section IV

Inhalation of all dusts are hazardous. Crystalline silica when inhaled may cause silicosis. This is a chronic slowly developing lung disease. Cement binder may cause eye and skin burns. Chromium oxide may revert to hexavalent chrome during firing with other materials (for example, Li, Na, K, Ca, Mg, etc.). Certain water insoluble chromium compounds are carcinogens. Used product should be disposed of as hazardous waste if hexavalent chromium compounds are detectable.

Reactivity — Section V

This material is stable under ordinary conditions.

Emergency and First Aid Procedures — Section VI

Terminate exposure. If affected, consult a physician. Flush eyes and skin with water.

Spill, Leak, and Disposal — Section VII

Avoid inhalation of dusts. Protect eyes and skin. Consult with local, state, and federal authorities on waste removal regulations.

Special Protection Information — Section VIII

Wear NIOSH approved safety masks, eye glasses, and gloves. Ventilate where necessary.

Special Precautions and Comments — Section IX

Products having a C/A notation contain trivalent chrome in their as sold form.

Prepared By: I. Dulberg

Title: Technical Manager

Brick, High Alumina, Ceramic and Phosphoric Acid Bo

MATERIAL SAFETY DATA SHEET

J.H. FRANCE REFRACTORIES CO.

SNOW SHOE, PA 16874

TELEPHONE 814-387-6811

Date Prepared:
Nov. 19, 1985

Date Revised:

General Classification of Product: BRICK, HIGH ALUMINA, CERAMIC AND PHOSPHORIC ACID BOND

Trade Name/Synonym of Product:

TITAN 50%
FRANCO 60% LP
ANDALU
*SPARTAN 75CB
SPARTAN 80
CORINDON
FRANCO 60A
TITAN L
FRANCITE 70
FRANCITE 70L
SPARTAN 85B
SPARTAN 85S
*SPARTAN 85CB
SPARTAN 90
SPARTAN 90D
**SPARTAN C/A 10
BHA
*SPARTAN 75CB-L

Hazardous Ingredients — Section I

Ingredient	CAS Number
Crystalline Silica	7631-86-9
*Phosphoric Acid	7664-38-2
**Chromium Trioxide	1310-72-2

Physical Data — Section II

Appearance & Color
Tan, Grey, or Green, Geometric Solid

Odor & Solubility
Odorless, -insoluble in water and most acids
-soluble in Hydrogen Fluoride Acid

Fire & Explosion Data — Section III

This material is noncombustible. Use extinguishing media appropriate to the surrounding area.

Health Hazard Data — Section IV

Inhalation of all dusts are hazardous. Crystalline silica in the lungs can cause silicosis. This is a chronic slowly developing disease. Phosphoric acid may cause skin and eye irritation. Chromium oxide may revert to the hexavalent form during firing in service with other materials (for example, Li, Na, K, Ca, Mg, etc.). Certain water insoluble chromium compounds are carcinogen. Used product should be disposed of as hazardous waste if hexalent chromium compounds are detectable.

Reactivity **Section V**

This material is stable under ordinary conditions.

Emergency and First Aid Procedures **Section VI**

Terminate exposure. If affected, consult a physician. Flush eyes and skin with water.

Spill, Leak, and Disposal **Section VII**

Avoid inhalation of all dusts. Protect eyes. Consult with proper state, local, and federal authorities on waste removal regulations.

Special Protection Information **Section VIII**

Wear NIOSH approved safety masks, eye glasses, and gloves. Ventilate where necessary.

Special Precautions and Comments **Section IX**

Products having a C/A notation contain trivalent chrome.

Prepared By: I. Dulberg

Title: Technical Manager

Although reasonable care has been taken in the preparation of this MSDS, J. H. France Refractories Co. extends no warrantees, makes no representation and assumes no responsibilities as to the accuracy or suitability of such information for application to the purchaser's intended purposes or for consequences of its use.

CEMENTED CARB. DE PROD W/ COBALT BINDER

Chemical Name: Cemented Carbide Product with Cobalt binder.

Trade Name and Synonyms: All FIELD/RHINO Carbide Grades

Chemical Family: Refractory Metal Carbide

Molecular Weight: N/A

PHYSICAL DATA

Appearance and Odor: Dark Gray Metal/No Odor
Boiling Point: N/A
Vapor Pressure (mm Hg): N/A
Vapor Density (Air = 1): N/A
Solubility in Water: Insoluble
Specific Gravity (H_2O = 1): 11.0 to 15.5
Percent Volatile by Volume: 0
Evaporation rate: N/A
How Best Monitored: Air sample

HAZARDOUS INGREDIENTS

Material	Percent by Weight		OSHA PEL	ACGIH TLV
Tungsten Carbide (limits for Tungsten dust)	67 - 97%	*	———	5 mg/m³
Cobalt	3 - 25%	*	0.1 mg/m³	0.1 mg/m³
Tantalum Carbide (limits for Tantalum dust)	0.0 - 50%	*	5 mg/m³	5 mg/m³
Chromium Carbide (limits for Chromium(+3) dust)	0.0 - 5.1%	*	1 mg/m³	0.5 mg/m³
Chromium(+3)	0.0 - 4.5%	*	1 mg/m³	0.5 mg/m³

**Depends on grade specifications*

HEALTH HAZARD DATA

Routes of Exposure:
Grinding cemented carbide product will produce dust of potentially hazardous ingredients which can be inhaled, swallowed or come in contact with the skin or eyes.

Effects of Overexposure:

Inhalation —Dust from grinding can cause irritation of the nose and throat. It also has the potential for causing transient or permanent respiratory disease, including occupational exposed individuals. It is reported that cobalt dust is the most probable cause of such respiratory diseases. Symptoms include productive cough, wheezing, shortness of breath, chest tightness and weight loss. Interstitial fibrosis (lung scarring) can lead to permanent disability or death. Certain pulmonary conditions may be aggravated by exposure.

Skin Contact—Can cause irritation or an allergic skin rash due to cobalt sensitization. Certain skin conditions, such as dry skin, may be aggravated by exposure.

Eye Contact —Can cause irritation.

Ingestion —Reports outside the industry suggest that ingestion of significant amounts of cobalt has the potential for causing blood, heart and other organ problems.

Emergency and First Aid Procedures: Applicable for dusts or mists

Inhalation —If symptoms of pulmonary involvement develop (coughing, wheezing, shortness of breath, etc.), remove from exposure and seek medical attention.

Skin Contact—If irritation or rash occurs, thoroughly wash affected area with soap and water and isolate from exposure. If irritation or rash persists, seek medical attention.

Eye Contact —If irritation occurs, flush with copious amounts of water. If irritation persists, seek medical attention.

Ingestion —If substantial quantities are swallowed, dilute with a large amount of water, induce vomiting and seek medical attention.

Carcinogenic Assessment (NTP Annual Report, IARC Monographs, other):
None of the components of this material have been identified as known or suspected carcinogens by NTP, IARC or OSHA.

FIRE AND EXPLOSION HAZARD DATA

Flash Point: N/A **Test Method Used:** ---
Flammable Limits: N/A **LEL:** --- **UEL:** ---

Hard Cemented Carbide Product is not a fire hazard. Dusts generated in grinding operations may ignite if allowed to accumulate and subjected to an ignition source.

Extinguishing Media: For powder fires, smother with dry sand, dry dolomite, ABC type fire extinguisher, or flood with water.

Special Fire Fighting Procedures: For a powder fire confined to a small area, use a respirator approved for toxic dusts and fumes. For a large fire, fire fighters should use self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Dusts may present a fire or explosion hazard under rate favoring conditions of particle size, dispersion and strong ignition source. However, this is not expected to be a problem under normal handling conditions.

REACTIVITY DATA

Stability:
Unstable
Stable X

Conditions to Avoid: N/A

Incompatibility: Contact of dust with strong oxidizers may cause fire or explosions.

Materials to Avoid: Strong Acids

Hazardous Decomposition Products: None

Hazardous Polymerization:
May Occur
Will Not Occur X

Conditions to Avoid: N/A

SPILL OR LEAK PROCEDURES

Steps to be Taken in Case Material is Released or Spilled: Ventilate area of spill. Clean up using methods which avoid dust generation such as vacuum (with appropriate filter to prevent airborne dust levels which exceed the PEL or TLV), wet dust mop or wet clean-up. If airborne dust is generated, use an appropriate NIOSH approved respirator.

Waste Disposal Method: Dispose of in accordance with appropriate government regulations. May be sold as scrap for reclaim.

SPECIAL PROTECTION INFORMATION

Respiratory Protection: Use an appropriate NIOSH approved respirator if airborne dust concentrations exceed the appropriate PEL or TLV. All appropriate requirements set forth in 29 CFR 1910.134 should be met.

Ventilation: Use local exhaust ventilation which is adequate to limit personal such equipment is not available use respirators as specified above.

Protective Gloves: Protective Gloves or Barrier cream are recommended when contact with dust or mist is likely. Prior to applying the Barrier cream or using protective gloves, wash thoroughly.

Other Protective Equipment: N/A

Eye Protection: Safety glasses with side shields or goggles should be worn.

SPECIAL PRECAUTIONS

Precautions to be Taken in Handling and Storage: Maintain good housekeeping procedures to prevent dust accumulation during grinding. Avoid dust inhalation and direct skin contact with dust.

Do not strike or impact product with hardened steel hammer or similar device because of possible fracture/shattering of product. Product should be pressed if inserted into another metal part or product.

Other Precautions: Clean up using methods which avoid dust generation such as vacuum (with appropriate filter to prevent airborne dust levels which exceed the PEL OR TLV), wet dust mop or wet clean-up. If airborne dust is generated, use an appropriate NIOSH approved respirator.

Wash hands thoroughly after handling, before eating or smoking. Wash exposed skin at the end of work shift. Do not shake clothing, rags or other items to remove dust. Dust should be removed by washing or vacuuming (with appropriate filters) the clothing, rags or other items.

Periodic medical examinations are recommended for individuals regularly exposed to dust or mist.

In case of questions please call
FIELD TOOL SUPPLY CO.
312-278-1900

Issue Date: 11/85
Supersedes: N/A

Field TOOL SUPPLY CO.
Div. of
Marco Holding Co.

MATERIAL SAFETY DATA SHEET

CEMENTED CARBIDE PRODUCT WITH COBALT BINDER

WARNING

CEMENTED CARBIDE PRODUCT

Contains one or more of the following substances: Tungsten Carbide, Cobalt, Tantalum Carbide, Chromium Carbide, Chromium, Molybdenum Carbide, Molybdenum, or Vanadium Carbide.

Read Material Safety Data Sheet for applicable carbide grade before grinding product.

WARNING: GRINDING OF THIS PRODUCT WILL PRODUCE DUST OF POTENTIALLY HAZARDOUS INGREDIENTS.

Dust from grinding this product can cause nose, throat, skin and eye irritation and temporary or permanent respiratory disease in a small percentage of exposed individuals. Permanent respiratory disease can lead to disability or death. Coolant mist from wet grinding may contain dust.

Avoid breathing dust or mist. • Use protective devices.

Avoid prolonged skin contact with dust or mist.

Use adequate ventilation when grinding.

Maintain dust level below OSHA and ACGIH levels.

Wash hands thoroughly after handling, before eating or smoking.

Dispose of materials according to local, state and/or federal regulations.

DETAILS INSIDE

IMRIE-GIELOW, INC.
2823 PAPIN STREET • ST. LOUIS, MISSOURI 63103
(314) 772-4200 • TWX 910-761-1087

Mr. Dave Cornell
Cerro Copper Products
P.O. Box 681
East St. Louis, MO 62202

September 6, 1985

Ref: Manville - MSDS
No. 3111 - Rev. #2 - dtd. 5/13/85
No. 3121 - " " " " "
No. 3138 - " " " " "

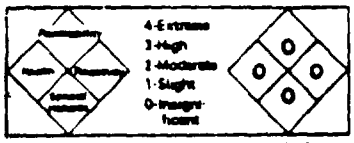
Enclosed is Manville's Material Safety Data Sheet. Because Refractory Ceramic Fibers are not currently regulated in the occupational environment by any Federal or State Health Agency, Manville Corporation has established work place guidelines and have data from monitoring exposure levels where refractory fiber products are manufactured. Please refer to Pages 6 thru 10 of the enclosed Manville Brochure titled "Health and Safety Aspects of Refractory Ceramic Fibers", numbered HSE-66 5-85. These same precautionary procedures are recommended at your facility.

Two (2) known investigations which studied the effects of Refractory Ceramic Fibers on laboratory animals have essentially been completed, see Pages 4 and 5, HSE-66 5-85. The results of these tests suggest further investigation and work place caution. Two (2) new studies, one in Europe and the other in the United States, are in the initial planning stages to study the effects on Ceramic Fiber manufacturing workers; not animals. Results of these new tests are not expected for 3-5 years; however, any new information developed by Manville will be forwarded by us to you immmediately.

Thank you for your Refractory Ceramic Fiber business. We hope to continue to be your Refractory Ceramic Fiber supplier.

Very truly yours,

Kenneth D. Gielow



NFPA FIRE HAZARD SYMBOL†
See NFPA 704 for detailed explanation.

MATERIAL SAFETY DATA SHEET

No.: 3111 Rev. No.: 2
Date Revised: 05/13/85

Manville

cerafelt

I. PRODUCT IDENTIFICATION

Trade Name(s) : CERAFELT
Generic Name: REFRACTORY CERAMIC FIBER INSULATION
Chemical Name: ALUMINA SILICA

CAS #: NONE ASSIGNED
Formula: MIXTURE

Manufacturer: MANVILLE BUILDING MATERIALS CORP.
Address: P.O.BOX 5108
City: DENVER State: CO Zip: 80217

Telephone: (303)978-3120
Emergency:

II. PRODUCT INGREDIENTS

INGREDIENT NAME	CAS NUMBER	%	PERMISSIBLE EXPOSURE LIMIT
REFRACTORY CERAMIC FIBER PHENOLFORMALDEHYDE RESIN (CURED)	NONE 25104-55-6	91/98 9/2	2F/CC*
CRYSTALLINE SILICA (CRISTOBALITE) WILL FORM AFTER SERVICE AT TEMPERATURES >1000°C. THE "AFTER SERVICE" DUSTS WILL TYPICALLY CONTAIN >20% CRISTOBALITE.	14464-46-1	>20	1/2((10MG/M³)/(%SiO₂+2))

*MANVILLE WORKPLACE EXPOSURE GUIDELINE.

III. PHYSICAL DATA

Appearance and Odor: FELTED BLANKET-SLIGHT PHENOLIC ODOR.

Boiling Point: NA
Vapor Pressure: NA
Water Solubility (%) : NIL
Vapor Density (Air=1) : NA

Evaporation Rate (NA = 1) : NA
Specific Gravity (water = 1) : 2.6
Melting Point: >2500°F
% Volatile by Volume: NIL

IV. FIRE AND EXPLOSION DATA

Flash Point (Method) : NONFLAMMABLE
Flammable Limits: LEL: NA % UEL: NA %
Extinguishing Media: NA
Unusual Fire or Explosion Hazards: NONE

NFPA Flammable/Combustible Liquid Classification: NA
Auto-Ignition Temperature: NA

Special Fire-Fighting Procedures: NONE

V. HEALTH HAZARDS A. Summary/Risks

Summary: THIS PRODUCT IS UNDER INVESTIGATION AS A POSSIBLE ANIMAL CARCINOGEN. ANIMAL STUDIES TO DATE ARE INCONCLUSIVE. EXPOSURES TO DUST FROM THIS PRODUCT SHOULD BE MINIMIZED UNTIL FURTHER ANIMAL AND HUMAN STUDIES ARE COMPLETE.
THIS PRODUCT IS SUSPECTED TO BE AN ANIMAL CARCINOGEN.

Medical conditions which may be aggravated: PRE-EXISTING UPPER RESPIRATORY AND LUNG DISEASES SUCH AS,BUT NOT LIMITED TO, BRONCHITIS, EMPHYSEMA AND ASTHMA.
Target Organ(s) : LUNG AND SKIN
Acute Health Effects: IRRITATION OF SKIN AND UPPER RESPIRATORY SYSTEM.

Chronic Health Effects: NO HUMAN EXPOSURE STUDIES WITH THIS PRODUCT HAVE BEEN REPORTED. AFTER SERVICE DUSTS CONTAIN CRISTOBALITE. PROLONGED EXPOSURE TO "AFTER SERVICE" DUSTS MAY CAUSE LUNG DISEASE (SILICOSIS).

Primary Entry Route(s) : INHALATION AND SKIN CONTACT.

V. HEALTH HAZARDS B. Signs/Symptoms of Overexposure

Inhalation: IRRITATION OR TICKLE IN THROAT AND NOSE.

Skin Contact: TEMPORARY IRRITATION OR RASH.

Skin Absorption: NA

Ingestion: MAY CAUSE TEMPORARY IRRITATION OF GI TRACT.

Eyes: TEMPORARY IRRITATION OR INFLAMMATION.

V. HEALTH HAZARDS C. First Aid/Emergency Procedures

Inhalation: REMOVE TO FRESH AIR. DRINK WATER TO CLEAR THROAT AND BLOW NOSE.

Skin Contact: WASH AFFECTED AREAS GENTLY WITH SOAP AND WARM WATER.

Skin Absorption: NA

Ingestion: NA

Eyes: FLUSH EYES WITH COPIOUS QUANTITIES OF WATER A MINIMUM OF 15 MINUTES. IF IRRITATION PERSISTS CONSULT A PHYSICIAN.

VI. REACTIVITY DATA

MATERIAL IS STABLE. HAZARDOUS POLYMERIZATION CANNOT OCCUR.
Chemical Incompatibilities: HYDROFLUORIC ACID
Conditions to Avoid: NONE IN DESIGNED USE.

Hazardous Decomposition Products: NONE HAVE BEEN DETERMINED.

VII. SPILL OR LEAK PROCEDURES

Procedures for Spill/Leak: VACUUM CLEAN DUST WITH EQUIPMENT FITTED WITH HEPA FILTER. IF SWEEPING IS NECESSARY USE A DUST SUPPRESSANT.

Waste Management: WASTES GENERATED DURING APPLICATION, DEMOLITION, BREAKAGE OR SPILLAGE ARE NOT HAZARDOUS WASTES AS DEFINED BY RCRA(40 CFR PART 261). COMPLY WITH FEDERAL, STATE AND LOCAL REGULATIONS. METHOD OF DISPOSAL-LANDFILL. RQ-N/A.

VIII. SPECIAL PROTECTION INFORMATION

Goggles: GOGGLES OR FACE SHIELD ARE RECOMMENDED PARTICULARLY WHEN WORKING OVERHEAD.
Gloves: NOT NORMALLY REQUIRED.
Respirator: 3M9900 OR EQUIVALENT FOR EXPOSURES BETWEEN 2F/CC AND 5F/CC AND/OR UP TO 10 TIMES CRISTOBALITE PEL. SURVIVAIR FULL FACE PIECE 1080-00 OR EQUIVALENT ABOVE THESE CONDITIONS.
Ventilation: USE ADEQUATE EXHAUST VENTILLATION WHEN INSTALLING. USE DUST COLLECTION WHEN TEARING OUT.

Other: ABOVE 50F/CC AND/OR 100 TIMES THE CRISTOBALITE PEL USE MSA 01-00-06 FULL FACE PIECE TYPE C SUPPLIED-AIR RESPIRATOR OR EQUIVALENT.
Special Considerations for repair/maintenance of contaminated equipment: USE PROPER RESPIRATORY PROTECTION.

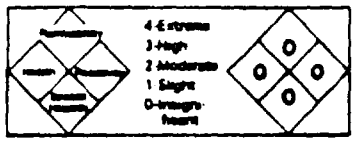
IX. SPECIAL PRECAUTIONS

Storage Segregation Hazard Classes: NA
*** ALWAYS SEGREGATE MATERIALS BY MAJOR HAZARD CLASS ***
Special Handling/Storage: KEEP MATERIAL DRY

Special Workplace Engineering Controls: ADEQUATE VENTILLATION TO KEEP DUST LEVEL TO BELOW PEL/TLV.

Other: FOR ADDITIONAL INFORMATION, REFER TO MANVILLE SERVICE CORP BULLETIN HSE-66B, AVAILABLE FROM: HEALTH,SAFETY & ENVIRONMENT DEPT.,MANVILLE SERVICE CORPORATION, P.O.BOX 5108, DENVER, CO 80217

Prepared/Revised by: KENNETH A. ROBERTS **Title:** MGR., ENVIRONMENTAL SERVICES



NFPA FIRE HAZARD SYMBOL†
See NFPA 704 for detailed explanation.

MATERIAL SAFETY DATA SHEET

No.: 3121 Rev. No.: 2
Date Revised: 05/13/85

Manville

I. PRODUCT IDENTIFICATION

Trade Name(s) : CERAFIBER
Generic Name: REFRACTORY CERAMIC FIBER INSULATION
Chemical Name: ALUMINA SILICA

CAS #: NONE ASSIGNED
Formula: MIXTURE

Manufacturer: MANVILLE BUILDING MATERIALS CORP.
Address: P.O.BOX 5108
City: DENVER State: CO Zip: 80217

Telephone: (303)978-3120
Emergency:

II. PRODUCT INGREDIENTS

INGREDIENT NAME	CAS NUMBER	%	PERMISSIBLE EXPOSURE LIMIT
REFRACTORY CERAMIC FIBER	NONE	100	2F/CC*
CRYSTALLINE SILICA (CRISTOBALITE) WILL FORM AFTER SERVICE AT TEMPERATURES >1000°C. THE "AFTER SERVICE" DUSTS WILL TYPICALLY CONTAIN>20% CRISTOBALITE.	14464-46-1	>20	1/2((10MG/M³)/(%SiO_2+2))

*MANVILLE WORKPLACE EXPOSURE GUIDELINE.

III. PHYSICAL DATA

Appearance and Odor: WHITE FIBER-NO ODOR.

Boiling Point: NA
Vapor Pressure: NA
Water Solubility (%) : NIL
Vapor Density (Air=1) : NA

Evaporation Rate (NA = 1) : NA
Specific Gravity (water = 1) : 2.6
Melting Point: >2500°F
% Volatile by Volume: NIL

IV. FIRE AND EXPLOSION DATA

Flash Point (Method) : NONFLAMMABLE
Flammable Limits: LEL: NA % UEL: NA %
Extinguishing Media: NA
Unusual Fire or Explosion Hazards: NONE

NFPA Flammable/Combustible Liquid Classification: NA
Auto-Ignition Temperature: NA

Special Fire-Fighting Procedures: NONE

V. HEALTH HAZARDS A. Summary/Risks

Summary: THIS PRODUCT IS UNDER INVESTIGATION AS A POSSIBLE ANIMAL CARCINOGEN. ANIMAL STUDIES TO DATE ARE INCONCLUSIVE. EXPOSURES TO DUST FROM THIS PRODUCT SHOULD BE MINIMIZED UNTIL FURTHER ANIMAL AND HUMAN STUDIES ARE COMPLETE.
THIS PRODUCT IS SUSPECTED TO BE AN ANIMAL CARCINOGEN.

Medical conditions which may be aggravated: PRE-EXISTING UPPER RESPIRATORY AND LUNG DISEASES SUCH AS,BUT NOT LIMITED TO, BRONCHITIS, EMPHYSEMA AND ASTHMA.
Target Organ(s) : LUNG AND SKIN
Acute Health Effects: IRRITATION OF SKIN AND UPPER RESPIRATORY SYSTEM.

Chronic Health Effects: NO HUMAN EXPOSURE STUDIES WITH THIS PRODUCT HAVE BEEN REPORTED. AFTER SERVICE DUSTS CONTAIN CRISTOBALITE. PROLONGED EXPOSURE TO "AFTER SERVICE" DUSTS MAY CAUSE LUNG DISEASE (SILICOSIS).

Primary Entry Route(s) : INHALATION AND SKIN CONTACT.

V. HEALTH HAZARDS B. Signs/Symptoms of Overexposure

Inhalation: IRRITATION OR TICKLE IN THROAT AND NOSE.

Skin Contact: TEMPORARY IRRITATION OR RASH.

Skin Absorption: NA

Ingestion: MAY CAUSE TEMPORARY IRRITATION OF GI TRACT.

Eyes: TEMPORARY IRRITATION OR INFLAMMATION.

V. HEALTH HAZARDS C. First Aid/Emergency Procedures

Inhalation: REMOVE TO FRESH AIR. DRINK WATER TO CLEAR THROAT AND BLOW NOSE.

Skin Contact: WASH AFFECTED AREAS GENTLY WITH SOAP AND WARM WATER.

Skin Absorption: NA

Ingestion: NA

Eyes: FLUSH EYES WITH COPIOUS QUANTITIES OF WATER A MINIMUM OF 15 MINUTES. IF IRRITATION PERSISTS CONSULT A PHYSICIAN.

VI. REACTIVITY DATA

MATERIAL IS STABLE. HAZARDOUS POLYMERIZATION CANNOT OCCUR.
Chemical Incompatibilities: HYDROFLUORIC ACID
Conditions to Avoid: NONE IN DESIGNED USE.

Hazardous Decomposition Products: NONE HAVE BEEN DETERMINED.

VII. SPILL OR LEAK PROCEDURES

Procedures for Spill/Leak: VACUUM CLEAN DUST WITH EQUIPMENT FITTED WITH HEPA FILTER. IF SWEEPING IS NECESSARY USE A DUST SUPPRESSANT.

Waste Management: WASTES GENERATED DURING APPLICATION, DEMOLITION, BREAKAGE OR SPILLAGE ARE NOT HAZARDOUS WASTES AS DEFINED BY RCRA(40 CFR PART 261). COMPLY WITH FEDERAL, STATE AND LOCAL REGULATIONS. METHOD OF DISPOSAL-LANDFILL. RQ-N/A.

VIII. SPECIAL PROTECTION INFORMATION

Goggles: GOGGLES OR FACE SHIELD ARE RECOMMENDED PARTICULARLY WHEN WORKING OVERHEAD.
Gloves: NOT NORMALLY REQUIRED.
Respirator: 3M9900 OR EQUIVALENT FOR EXPOSURES BETWEEN 2F/CC AND 5F/CC AND/OR UP TO 10 TIMES CRISTOBALITE PEL. SURVIVAIR FULL FACE PIECE 1080-00 OR EQUIVALENT ABOVE THESE CONCENTRATIONS.
Ventilation: USE ADEQUATE EXHAUST VENTILLATION WHEN INSTALLING. USE DUST COLLECTION WHEN TEARING OUT

Other: ABOVE 50F/CC AND/OR 100 TIMES THE CRISTOBALITE PEL USE MSA 01-00-06 FULL FACE PIECE TYPE C SUPPLIED-AIR RESPIRATOR OR EQUIVALENT.
Special Considerations for repair/maintenance of contaminated equipment: USE PROPER RESPIRATORY PROTECTION.

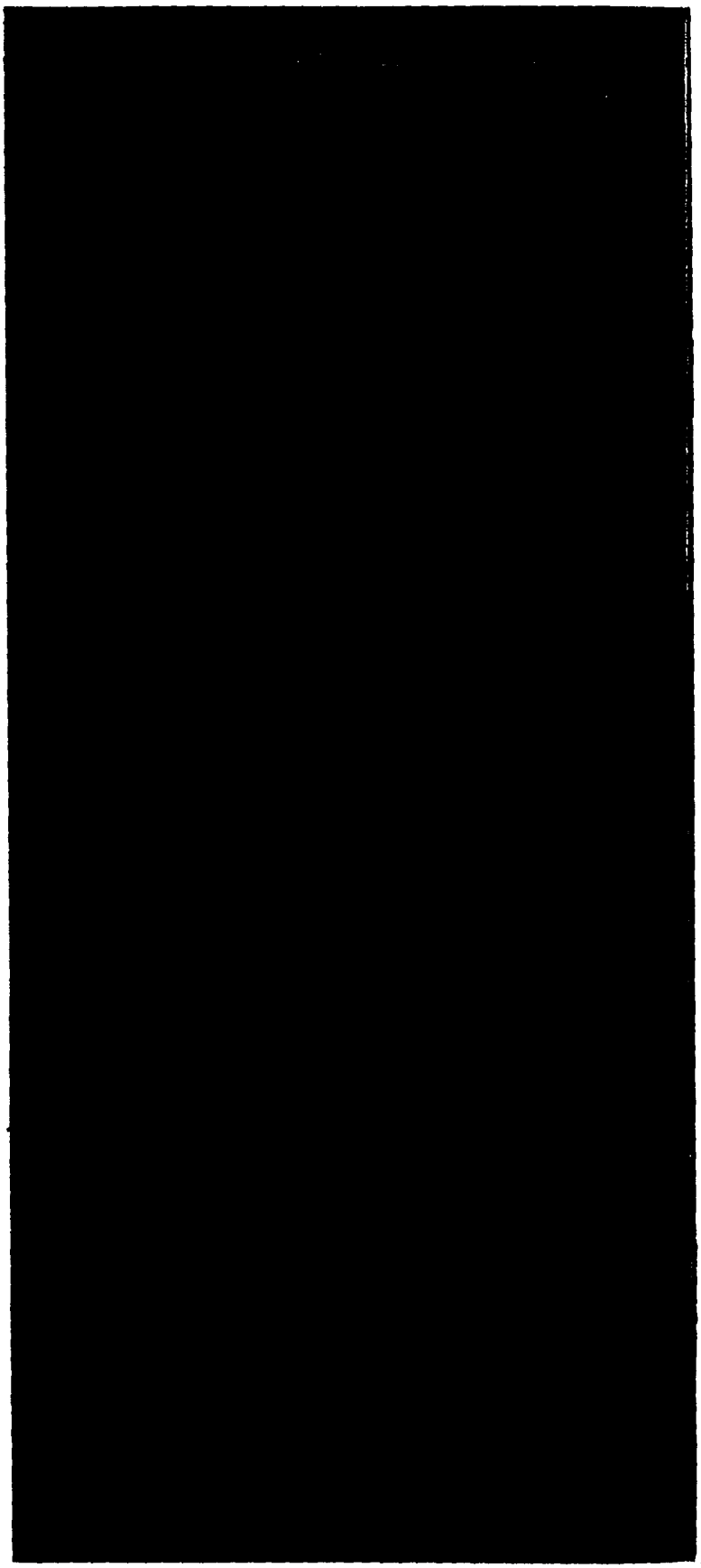
IX. SPECIAL PRECAUTIONS

Storage Segregation Hazard Classes: NA
*** **ALWAYS SEGREGATE MATERIALS BY MAJOR HAZARD CLASS** ***
Special Handling/Storage: KEEP MATERIAL DRY

Special Workplace Engineering Controls: ADEQUATE VENTILLATION TO KEEP DUST LEVEL TO BELOW PEL/TLV.

Other: FOR ADDITIONAL INFORMATION, REFER TO MANVILLE SERVICE CORP BULLETIN HSE-66B, AVAILABLE FROM HEALTH,SAFETY & ENVIRONMENT DEPT.,MANVILLE SERVICE CORPORATION, P.O.BOX 5108, DENVER, CO 80217

Prepared/Revised by: KENNETH A. ROBERTS **Title:** MGR., ENVIRONMENTAL SERVICES



Refractory ceramic fiber is a synthetic amorphous glassy alumina silica product which is created from molten masses of raw materials under highly controlled conditions. This family of fibers is manufactured by Manville and marketed under the trade names of Cerawool™, Cerafiber®, Cerachrome™, Cerachem™, Cerafelt™, and Kem*star™.

This bulletin cancels bulletin IND-493, dated July 1983.

Refractory ceramic fiber (RCF) has been produced in commercial quantities for about 25 years. Because of this relatively short history, we feel that it is necessary to establish through testing whether or not the health effects of these fibers are identical to those reported for glass and rockwool fibers. The RCF industry, through the auspices of the Thermal Insulation Manufacturers Association (TIMA), is sponsoring animal inhalation studies as well as epidemiological studies of workers in the industry. Until such time as definitive answers are available, it is advisable to follow certain common sense work practices designed to minimize exposure. These recommendations and the reasons for them will be covered in appropriate sections of this publication.

Skin Irritation

Refractory ceramic fiber and most glass fibers are very similar in their ability to cause skin and upper respiratory irritation. *SKIN IRRITATION* is experienced by some workers in refractory fiber manufacturing facilities as well as some people working with refractory fiber-containing materials. This skin irritation and possible inflammation is a mechanical reaction due to sharp, broken ends of fiber that rub or become embedded in the outer layer of the skin. Skin reactions vary directly with the size and the stiffness of the fiber handled, with fibers of large diameter (greater than 5 micrometers) being more likely to cause irritation and itching. Irritation normally does not persist for any length of time and can be relieved by washing exposed skin areas gently in warm water with mild soap.

Some individuals may be more sensitive to irritation from refractory ceramic fiber than are others, and a relatively small number may be forced to seek other types of employment. The vast majority of workers, however, can control skin irritation by following the work practices outlined at the end of this bulletin.

Upper Respiratory Irritation

It is possible that some workers may experience temporary *UPPER RESPIRATORY IRRITATION* (that is, scratchiness or burning of the nose or throat) if airborne refractory fibers are generated during manufacture or handling of refractory fiber-containing products. Like skin irritation, upper respiratory irritation is a mechanical reaction to sharp, broken fibers. It is not an allergic reaction and the irritation does not persist.

Unprotected exposures to high concentrations of airborne refractory ceramic fiber may produce a transitory condition, usually manifested by coughing or wheezing. Careful attention to housekeeping and proper work practices can effectively control airborne refractory ceramic fiber concentrations to prevent this upper respiratory irritation. The effects subside soon after the worker is removed from exposure and have no known long-lasting impact on health.

After Service

Refractory ceramic fiber which has been in service at elevated temperatures (greater than 1000°C) may undergo partial conversion to cristobalite, a form of crystalline silica which can cause respiratory disease (silicosis). This is a consequence of the crystallization or devitrification of the fibers which occurs at high temperatures. The amount of cristobalite which is formed, the size of the individual crystallites and the nature of the matrix in which they are embedded are all a function of the temperature and the length of time the fiber has been heated.

Under normal use conditions, refractory ceramic fiber will generally be exposed to a temperature gradient. Consequently it is most probable that only the fiber nearest the hot surface will have an appreciable cristobalite content. It is also possible that the devitrified cristobalite-containing fiber will be more friable and therefore may generate a larger amount of dust when fiber is removed from a high temperature application. Experiments have not yet been conducted to ascertain whether or not these devitrified fibers are biologically active in animals.

For these reasons particular care should be taken during the "tear-out" of refractory ceramic fiber linings to

minimize generation of dust. Adherence to proper methods of dust suppression and control is imperative. The most prudent approach is to treat devitrified fibers as free crystalline silica. Even with adequate control, Manville recommends that a respirator approved by NIOSH for protection against pneumoconiosis-producing dusts be used by all workers in the area during removal operations.

Medical and Scientific Studies

There are no known published reports in medical literature dealing with the health experience of people who work with refractory ceramic fibers. Two studies, one in Europe and the other in the United States, are in the initial planning stages to study the health of workers involved in the manufacturing of refractory ceramic fibers. Initial results from those studies will be available in three to five years.

There are two known investigations which have studied the effects of refractory ceramic fibers on animals. An investigation by Davis, et al, in Edinburgh has been completed and published[1]. The other study is nearing completion at the Los Alamos National Laboratories[2] and should be available for publication within the next year. Summaries of the results of the Davis study and an interim report of the Los Alamos study will be covered below.

In his experiments, Davis injected refractory ceramic fibers into the abdomens of 32 rats. Intraperitoneal injection of fiber bypasses all of the animals' natural defenses and is used as an indicator of the relative biological activity of fibrous materials, although it does not duplicate any type of human exposure. In this experiment, three of the 32 animals developed primary abdominal tumors. Depending on the dose, scientists have found some tumor formation when injecting virtually all types of fibers directly into the abdomen. Such results from intraperitoneal injections have been found no matter what the experience has been in inhalation experiments.

Davis also exposed forty-eight rats to refractory ceramic fiber by inhalation for seven hours a day, five days a week, over a period of 224 days. The airborne dose of fibers longer than 5 microns was reported to be 95 fibers/cc.

Animals sacrificed at the end of the study were reported to have an average of 5% pulmonary fibrosis. At the end of the study, eight of the rats were found to have tumors with three animals demonstrating lung carcinomas.

The fibrosis and carcinoma found in the Davis study by inhalation were not expected and clearly point to the need for further study, while raising the normal level of concern.

In 1979, a large scale animal exposure experiment was begun at the Los Alamos National Laboratories involving several types of man-made fibers, including refractory ceramic fiber. In the Los Alamos study, two animal models were used—rats and hamsters. The rats were of a different strain than the ones used in the Davis study mentioned above. The Los Alamos study is not yet complete; results to date concerning refractory ceramic fiber will be summarized here and updated when the study is completed.

To date, inhalation experiments involving rats show no cancer or fibrosis in twenty-five animals examined; this conflicts sharply thus far with the Davis study. Inhalation experiments on hamsters showed one cancer (mesothelioma) in fifty animals, but no fibrosis was observed. One of 157 control animals developed a spontaneous tumor without exposure to fibers. The exposures were conducted at 200 f/cc, 6 hours a day, 5 days a week, for 24 months.

The researchers at Los Alamos also performed intraperitoneal injections of refractory ceramic fiber using both hamsters and rats. Most of the hamsters did not tolerate the initial injection of the fiber into their abdomens and died immediately after injection. Of the five animals so far reported who survived the injection, no turmors were found. Nineteen of the twenty-two rats examined developed tumors (primarily mesotheliomas) after intraperitoneal injection of refractory ceramic fiber. This result was very different from the results obtained by Davis.

While the results from the Davis and Los Alamos studies are conflicting in many ways, there is little doubt a higher level of caution now exists about the possible health implications of exposure to refractory ceramic fiber. In order to help clarify some of the uncertainties raised, new

studies have been designed and funded by TIMA to study the human experience as well as further animal studies with refractory ceramic fibers. This effort will begin in late 1985 and begin producing results in three to five years. Until more is known about the possible health effects of refractory ceramic fiber, care should be taken when using these products as detailed in this document.

Recommended Handling Procedures

Occupational Exposure Guidelines/Limits

Refractory ceramic fiber (RCF) is not currently regulated in the occupational environment by any Federal or State health agency. The Manville Corporation has established a workplace exposure guideline (WEG) of 2.0 fibers/cubic centimeter (f/cc) as a result of the medical and scientific findings available at this time. The WEG refers to an airborne concentration of a substance, time weighted for a 7 to 8 hour workday and a 40 hour workweek, under which it is believed that nearly all workers may be repeatedly exposed day after day without adverse health effects. No employee should work without protection in environments where the airborne concentrations exceed 10 f/cc even for short periods of time.

Industrial hygiene monitoring data obtained on a regular basis at Manville locations where RCF products are manufactured, show that the exposures are well below the WEG of 2.0 f/cc. In fact, the majority of these exposures are below 0.5 f/cc.

Industrial hygiene monitoring data obtained under typical field conditions indicate that in confined areas with poor exhaust ventilation it is entirely possible to exceed the WEG of 2.0 f/cc. In such situations, temporary exhaust ventilation should be installed. If this is not feasible, the use of respiratory protection and specified work practices must be required, as detailed elsewhere in this document.

Refractory ceramic fiber poses an additional health concern after the product has been in service. Crystalline silica in the form of cristobalite is formed. Typically, bulk material contains greater than 20 per cent cristobalite while respirable gravimetric samples contain greater than 15 per cent cristobalite. Cristobalite exposures may cause lung disease (silicosis) if overexposure occurs. The Occupational Safety and Health Administration (OSHA), United States Department of Labor regulates exposures to cristobalite under 29 CFR 1910.1000, table Z-3 - Mineral Dusts. One half the value calculated from the mass formula, $(10mg/m^3) / (\%\ SiO2 + 2)$, is used to determine the appropriate permissible exposure limit, i.e. 18% cristobalite $\frac{1}{2}\ (10)/(18 + 2) = 0.25\ mg/m^3$.

Recommended Work Practices

The procedures recommended in the following section are good practices that apply when working where all types of dust can be generated. However, even though it is thought that they apply in only a fraction of the conditions expected with the use of RCF products, some recommendations are given for work environments where industrial hygiene measurements exceed values given elsewhere in this document. Also, some recommendations are only applicable to after service work with these products.

Loose Clothing. Wearing long-sleeved shirts and blouses, loose at the neck and wrists, along with long pants and caps will protect skin areas from coming in contact with refractory ceramic fiber. Loose clothing also helps prevent fiber from rubbing into the skin. Depending on job conditions, gloves may be necessary.

Minimize Dust. Mechanical dust collection systems should be used whenever refractory ceramic fiber materials are machine sawed or sanded. Handling and cutting should be done in a manner that will create the least amount of airborne dust.

Skin Irritation. If refractory ceramic fiber particles accumulate on exposed skin areas, do not rub or scratch. Remove the particles by washing the skin thoroughly but gently with warm water and mild soap. Using a good commercial skin cream or lotion after washing may be helpful.

Eye Protection. Safety glasses, goggles, or face shields should be worn whenever refractory ceramic fiber materials are being applied overhead or in areas where loose particles may get into the eyes.

Respirators. Respiratory protection must be worn to protect against breathing air contaminated with potentially harmful materials such as refractory ceramic fiber and cristobalite. Acceptable respirators are those approved by NIOSH for usage in specific airborne concentrations.

Refractory Ceramic Fiber Exposure Respirators

Concentration	Respirator
2.0 - 5.0 f/cc	3M 9900 or equivalent.
5.0 - 50.0 f/cc	Survivair full face piece with high efficiency filter 1090-00 or equivalent.
>50.0 f/cc	MSA 01-00-06 full face piece type C supplied-air or equivalent. OSHA approved air source required.

Cristobalite Exposure Respirators

Concentration	Respirator
up to 10 times PEL*	3M 9900 or equivalent.
10 to 100 times PEL*	Survivair full face piece with high efficiency filter 1090-00 or equivalent.
>100 times PEL*	MSA 01-00-06 full face piece type C supplied-air of equivalent. OSHA approved air source required.

*PEL = permissible exposure limit (OSHA). See Occupation Exposure Guidelines/Limit section of this document.

Respirator users should be instructed as to the proper use of respirators and their limitations, and must be fit-tested to assess the quality of fit. To test the respirator, cover the air inlets with the palm of the hand, inhale so the facepiece collapses slightly, then hold breath for a few seconds to see that it remains collapsed and there are no leaks. Another method is to place a substance with a distinct odor or taste near the respirator seal. It should be undetectable if the respirator fits well.

Disposable respirators should be discarded when soiled or when breathing resistance is noticed by the wearer. Non-disposables must be regularly cleaned, inspected and maintained.

A wearer of respiratory protection experiencing breathing difficulty while using respirators should be evaluated by a physician to determine the ability of the worker to wear a respirator.

Personal Protective Equipment. In work situations in which engineering controls and/or local exhaust ventilation are either technically not feasible or insufficient to reduce the airborne concentrations of refractory ceramic fibers to below a time weighted average of 2 f/cc, the following clothing guidelines are recommended:

1. Special clothing. Provide and require the use of special clothing, such as coveralls or similar whole-body clothing, head coverings, gloves, and foot coverings for any employee exposed to airborne concentrations of refractory ceramic fibers which exceed a ceiling of 10 f/cc. Provide changing rooms for employees working regularly in such an environment.

2. Clothes lockers. Provide two separate lockers or containers for each employee, so separated or isolated as to prevent contamination of the employee's street clothes from work clothes.

3. Laundering. Laundering of clothing contaminated with refractory ceramic fibers shall be done so as to prevent the release of airborne fibers in excess of the 2.0 f/cc WEG.

Housekeeping. Avoid unnecessary rehandling of scrap materials by keeping waste disposal equipment as close to working areas as possible. Don't let scrap material and debris pile up on floors and other surfaces. Follow an organized housekeeping program at all times. Vacuum dust with equipment fitted with HEPA filter. If sweeping is necessary, use a dust suppressant.

Waste Management. Wastes generated during application, demolition, breakage or spillage are not hazardous wastes as defined by RCRA (40 CFR Part 261). Comply with federal, state and local regulations. Method of disposal - landfill. RQ - N/A.

Footnotes

1. J.M.G. Davis, J. Addison, R.E. Bolton, K. Donaldson, A.D. Jones & A. Wright, "The Pathogenic Effects of Fibrous Ceramic Aluminum Silicate Glass Administered to Rats by Inhalation or Peritoneal Injection," *Biological Effects of Man-made Mineral Fibres*, Vol. 2, p. 303.

2. D.M. Smith, Principal Investigator; Interim Progress Report to Medical Scientific Committee of TIMA. Personal communication dated March 29, 1985.

Conoco Redind 32

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
CONOCO INC.	(405) 767-3456

ADDRESS (Number, Street, City, State, and ZIP Code)
1000 South Pine, Ponca City, Oklahoma 74601

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Lubricating & Hydraulic Oil	CONOCO REDIND OIL 32, 46, 68, 100
CHEMICAL FAMILY: Petroleum Hydrocarbon	FORMULA: Various Hydrocarbons

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS — None			BASE METAL — None		
CATALYST — "			ALLOYS — "		
VEHICLE — "			METALLIC COATINGS — "		
SOLVENTS — "			FILLER METAL PLUS COATING OR CORE FLUX — "		
ADDITIVES — "			OTHERS — "		
OTHERS — "					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
None		

SECTION III - PHYSICAL DATA

BOILING POINT (°F.) Initial	600	SPECIFIC GRAVITY (H_2O=1)	.88-.89
VAPOR PRESSURE (mm Hg.)	Nil	PERCENT, VOLATILE BY VOLUME (%)	0
VAPOR DENSITY (AIR=1)	NA	EVAPORATION RATE (_____=1)	Nil
SOLUBILITY IN WATER	Negligible		

APPEARANCE AND ODOR: Light brown viscous liquid - slight odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
380-440° F. COC			

EXTINGUISHING MEDIA
Water Spray, Foam, Carbon Dioxide, Dry Chemical

SPECIAL FIRE FIGHTING PROCEDURES
Do not enter fire area without proper protective equipment, including self-contained breathing apparatus.

UNUSUAL FIRE AND EXPLOSION HAZARDS
None

(Continued on reverse side)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
None established.

EFFECTS OF OVEREXPOSURE Not considered to be toxic orally or dermally; may cause eye irritation. May cause skin irritation on prolonged or repeated contact.

Excessive inhalation of mists & vapors may cause pulmonary disorders.

EMERGENCY AND FIRST AID PROCEDURES In case of eye contact, wash thoroughly with fresh water for at least 15 minutes and get medical attention. Skin contact--wash thoroughly with soap and water. Remove grossly contaminated clothing and wash before re-use. Grossly contaminated leather shoes should be discarded. If large amount of material is swallowed, induce vomiting and call a physician.

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*
Strong oxidizing materials, heat, flame.

HAZARDOUS DECOMPOSITION PRODUCTS Normal combustion forms carbon dioxide and water vapor; incomplete combustion may produce carbon monoxide.

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Clean up promptly by absorption in clay or earth.

WASTE DISPOSAL METHOD

Controlled incineration, store for professional removal and disposal. Avoid drainage into sewer unless it is specifically designed to handle hydrocarbons.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*
None required

VENTILATION		
	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)* Normal shop ventilation	OTHER

PROTECTIVE GLOVES	EYE PROTECTION
None required.	None required.

OTHER PROTECTIVE EQUIPMENT
None required.

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
May be stored outdoors or indoors away from furnace or other heating equipment.

OTHER PRECAUTIONS
In accordance with NFPA Code 30-1969 for Combustible Liquid, Class IIIB.

GPO 934-190

Mary Ann Chance
Coordinator
Hazard Communication Program

Conoco Inc.
P.O. Box 1267
Ponca City, OK 74603
(405) 767-2140

October 23, 1984

Cerro Copper Product Company
Post Office Box 681
East St. Louis, Illinois 62202

Attention: Mr. F. Baker Ottofy III

Dear Mr. Ottofy:

As per your request, this letter will serve to certify that, based on the formulation constituents, Conoco's Senior Toxicologist, W. D. Broddle, Ph.D., would not expect to find nitrosamines in the following three Conoco products for which we have furnished you Material Safety Data Sheets:

Redind Oil 32, 46, 68, 100, Conoco
Ice Machine Oils 46, 68, Conoco
Super Hydraulic Oil 22, 32, 46, 68, Conoco

If you have further questions, please do not hesitate to call.

Mary Ann Chance/nle

Mary Ann Chance
Coordinator
Hazard Communication Program

nle

cc: W. D. Broddle, Ph.D.

CERTECH

CERTECH
INCORPORATED

November 26, 1985

MATERIAL SAFETY DATA SHEET
SECTION I

CERTECH, INC.
1 PARK PLACE WEST
WOOD-RIDGE, NJ 07075
Phone (201) 939-7400

PRODUCT NAME: 1914A 1914H 414S 1714C 733K 853X
1814F 114P 1314Z 414G 114P-3

PRODUCT TYPE: Precision ceramic cores for hollow investment castings

CHEMICAL FAMILY: Refractory FORMULA: Proprietary

SECTION II
PRODUCT INGREDIENTS

CHEMICAL	TLV DUST	CONTENT %
SILICA, CRISTOBALITE	0.15 mg/m^3	0 - 20%
SILICA, FUSED	0.30 mg/m^3	0 - 100%
ZIRCONIUM SILICATE	5 mg/m^3	0 - 100%
ALUMINUM OXIDE	10 mg/m^3	0 - 85%

SECTION III
PHYSICAL DATA

SOLUBILITY IN WATER: Nil VOLATILES BY VOLUME (%): Nil
MELTING POINT: Not Applicable
APPEARANCE AND ODOR: White to beige in color, no odor, in solid molded shape.

SECTION IV
FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: None
EXTINGUISHING MEDIA: Not combustible
SPECIAL FIRE FIGHTING PROCEDURES: None
UNUSUAL FIRE AND EXPLOSION HAZARDS: None known

SECTION V
HEALTH HAZARD DATA

EFFECT OF OVEREXPOSURE TO THE DUST:

These materials, as received by the customer are sintered solids. Dust will occur only if the product is crushed, broken, abraded or cut. Alumina (Aluminum Oxide) and Zircon (Zirconium Silicate) are considered nuisance particulates. High exposure to their dust or fumes may produce irritation of the eyes and respiratory system. Fused Silica (Silicon Dioxide) is considered a mineral dust. Possible lung irritation could result from over-exposure.

EYES	ACUTE:	Causes mechanical irritation.
	CHRONIC:	None known
SKIN	ACUTE:	May cause skin irritation.
	CHRONIC:	None known
INHALATION	ACUTE:	May cause upper respiratory irritation
	CHRONIC:	May cause lung damage.
INGESTION	ACUTE:	Unknown
	CHRONIC:	Unknown

EMERGENCY AND FIRST AID PROCEDURES:

EYES: Immediately flush eyes with copious amounts of water for 15 minutes. Call physician if irritation persists.

SKIN: Wash skin with water followed with soap and water. If irritation continues, call physician.

INHALATION: Remove to fresh air. Get medical attention.

INGESTION: Call physician immediately. Induce vomiting only if instructed to do so by the physician.

SECTION VI
REACTIVITY DATA

STABILITY: Stable
INCOMPATIBILITY: Hydrofluoric acid and strong alkali.
HAZARD POLYMERIZATION: Will not occur.

SECTION VII
SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:

Remove by dry-sweeping or vacuum. Normal precautions should be taken for nuisance dust. Avoid inhalation of the dust.

WASTE DISPOSAL METHOD:

To landfill in accordance with local, state and federal regulations.

SECTION VIII
SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: None normally required. If TLV's are exceeded, a NIOSH approved respirator should be used. If material has been exposed to elevated temperatures (1600°F. (875° C.) or above), a NIOSH approved respirator for use with silica should be used.

VENTILATION: General mechanical ventilation is usually adequate.

EYE PROTECTION: Goggles or safety glasses as needed.

OTHER PROTECTION: Protective gloves, if desired.

SECTION IX
SPECIAL PRECAUTIONS

Normal precautions for nuisance dust should be observed.

All statements, technical information and recommendations contained herein are based on tests and data which this Company believes to be currently reliable, but the accuracy or completeness thereof is not guaranteed and no warranty of any kind is made with respect thereto. This information is not intended as a license to operate under or a recommendation to practice or infringe any patent of this Company or others covering any process, composition of matter or use. Since the Company shall have no control of the use of the product described herein, the Company assumes no liability for loss or damage incurred from the proper or improper use of such product. This information is offered solely for use in your evaluation of this product in respect to safety, health and environmental hazards.

PREPARED BY: Raymond A. Pietras

TITLE: Ceramic Engineer

Diamond Impregnated Segmental Blade
metal Bond

Flammability Rating
Health Rating
Reactivity Rating
HAZARD RATING
Please rate consistent with NFPA code

MATERIAL SAFETY DATA SHEET

SECTION I NAME AND PRODUCT

MANUFACTURER'S NAME	CONTACT
DRAKE CORPORATION	James R. Ritchie
ADDRESS (STREET, CITY, STATE AND ZIP CODE) 2723 Ivanhoe Avenue, St. Louis, Missouri 63139	EMERGENCY TELEPHONE NO. (314) 645 3539
Diamond Impregnated Segmental Blade, Metal Bond	APPROVED BY DATE
CHEMICAL FAMILY OR PRODUCT TYPE Metal Bonded Segment	

SECTION II COMPOSITION

CHEMICAL NAME		COMMON NAME	REG.* (Y/N)	CAS #	OSHA PERMISSIVE EXPOSURE LIMIT	ACGIH TLV	CARCINOGEN* (Y/N)
Cobalt, Co			Y	7440-48-4	0.1mg/m³	0.1mg/m³	N
Manganese, Mn			Y	7439-96-5		5mg/m³	N
Nickel, N			Y	7440-02-0		1mg/m³	Y
Silver, Ag						.1mg/m³	N
Tin, Sn					2mg/m³		N

* Materials are regulated by OSHA 29 CFR 1910.1200, Hazard Communication Standard, and/or the Massachusetts General Law Chapter 111F, Right To Know Regulations.

SECTION III PHYSICAL AND CHEMICAL DATA

BOILING POINT	NA	MELTING POINT	NA	SPECIFIC GRAVITY	6.0-14.00
VAPOR PRESSURE	NA	PERCENT VOLATILE BY VOL.	NA	VAPOR DENSITY	NA
EVAPORATION RATE	NA	SOLUBILITY IN WATER	NO	SOLUBILITY IN ALCOHOL	NO
SOLUBILITY IN OTHER SOLVENT: ACIDS		APPEARANCE AND ODOR: Bronze to metalic Gray, odorless			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT	NA	(METHOD USED)	FLAMMABLE LIMITS LEL UEL
EXTINGUISHING MEDIA	NA		
SPECIAL FIRE FIGHTING PROCEDURES	NONE		
EXPLOSION POTENTIAL	NONE		

SECTION V HEALTH, FIRST AID AND MEDICAL DATA

PRIMARY ROUTE(S) OF ENTRY	ACUTE AND CHRONIC HEALTH EFFECTS AND EFFECTS OF OVEREXPOSURE	FIRST AID AND MEDICAL INFORMATION
INHALATION	Airborne Ni Dust is regarded as a carcinogen via Inhalation. Dust generated may cause nose & throat irritation. Percentage of product in generated dust is very low.	Remove from exposure. Seek medical attention.
INGESTION	NAIF	Wash hands before eating or smoking. Seek medical attention.
SKIN CONTACT & ABSORPTION	Dust may cause irritation on contact.	Wash with soap & water. Remove from exposure, if persistent consult physician.
EYE	Mechanical eye irritation from dust.	Flush eyes with water. Seek medical assistance.
OTHER POTENTIAL HEALTH RISKS	Materials machined with this product may create dust above 10mg/m³	Consult physician if necessary.

SECTION IV CORROSIVITY AND REACTIVITY DATA

STABILITY UNSTABLE ☐ STABLE ☒ POLYMERIZATION MAY OCCUR ☐ WILL NOT OCCUR ☒

INCOMPATIBILITY (MATERIALS TO AVOID)

NONE

DECOMPOSITION PRODUCTS

NONE

CONDITIONS TO BE AVOIDED

NONE

SECTION VII STORAGE, HANDLING AND USE PROCEDURES

NORMAL STORAGE AND HANDLING

NO SPECIAL REQUIREMENTS

NORMAL USE

Use of this product generates dust, a very small part of which is the product itself. Use adequate ventilation. Use flood or mist coolants to control dust.

STEPS TO BE TAKEN IN CASE OF LEAKS OR SPILLS

NA

WASTE DISPOSAL METHOD

Abrasives & Metals are salvageable. Dispose of accordingly.

SECTION VIII PERSONAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (SPECIFY TYPE) OSHA Approved respirator recommended.

VENTILATION	
	LOCAL YES
	MECHANICAL (GENERAL) YES
	OTHER

PROTECTIVE GLOVES As required

EYE PROTECTION Safety glasses or goggles recommended.

OTHER EQUIPMENT

MEASURES TO BE TAKEN DURING REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT THAT HAS BEEN IN CONTACT WITH THIS MATERIAL

N/A

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE N/A

OTHER PRECAUTIONS

FOR COMPANY USE

The information and recommendations set forth herein are taken from sources believed to be accurate as of the date hereof; however, W. F. Meyers Company makes no warranty with respect to the accuracy of the information or the suitability of the recommendations, and assumes no liability to any user thereof.

**NAIF = NO APPLICABLE INFORMATION FOUND ***N/A = NOT APPLICABLE

ADAPTED FROM USDL
FORM NO LSB 005-4-MAY 1969

SHELL OIL COMPANY
SHELL CHEMICAL COMPANY
SHELL DEVELOPMENT COMPANY
SHELL PIPE LINE CORPORATION

copies for B. [illegible] 7-13-85

DONAX T-5

MSDS 67300-2

HAZARD RATING
NFPA: 1 / 1 / 0

56

MATERIAL SAFETY DATA SHEET

Information on this form is furnished solely for the purpose of compliance with the Occupational Safety and Health Act of 1970 and shall not be used for any other purpose. Use or dissemination of all or any part of this information for any other purpose may result in a violation of law or constitute grounds for legal action.

SECTION I

MANUFACTURER'S NAME: Shell Oil Company	EMERGENCY TELEPHONE NO.: (713) 473-9461
ADDRESS (Number, Street, City, State, and ZIP Code): One Shell Plaza, Houston, Texas 77002	
CHEMICAL NAME AND SYNONYMS: Automatic Transmission Fluid	TRADE NAME: DONAX® T-5
CHEMICAL FAMILY: Hydrocarbon	FORMULA: Code 53005

SECTION II HAZARDOUS INGREDIENTS*

COMPOSITION	Approx. %	SPECIES	LD50 ORAL	LD50 DERMAL	LC50 CONCENTRATION	LC50 HOURS
Petroleum hydrocarbons	80	Rat	>5g/kg			
		Rabbit		>2g/kg		
Petroleum hydrocarbons Ca salt	14	Rat	>5g/kg			
Polymer containing, C,O,H,Ca	3	Rat	8.8g/kg			
Acrylate polymer	2					
Organic Zn dithiophosphate	<1	Rat	>1g/kg	≈3g/kg		
Aromatic amines	<1	Rat	>1.5g/kg			

This formulation calls for special precautions

SEE ATTACHED PAGE

SECTION III PHYSICAL DATA

BOILING POINT (°F)		SPECIFIC GRAVITY (H_2O=1)	0.91
VAPOR PRESSURE (mmHg)		PERCENT VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (______=1)	
SOLUBILITY IN WATER	Insol.		
APPEARANCE AND ODOR: Dark liquid, slight odor.			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): 345°F PMCC	FLAMMABLE LIMITS: N.A.	Lel	Uel

EXTINGUISHING MEDIA: Dry chemical type preferred

SPECIAL FIRE FIGHTING PROCEDURES: None special

UNUSUAL FIRE AND EXPLOSION HAZARDS: None unusual; CO, CO_2, NO_x, ZnO, PO_x, SO_x and oxygenates may form during combustion.

*Modified by Shell Oil Company

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
Vapor - not established. Oil mist - 5 mg/m^3

EFFECTS OF OVEREXPOSURE
Pulmonary irritation possible. Defatting action on skin. Prolonged or repeated contact may cause skin disorders such as dermatitis, folliculitus, oil acne or even skin cancer.

EMERGENCY AND FIRST AID PROCEDURES
Eye - flush with water for at least 15 minutes. Skin - remove oil by wiping or applying waterless hand cleaner, followed by washing with soap and water. Remove all contaminated clothing. Ingestion - induce vomiting if conscious and consult medical personnel.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID: Heat and mist formation; excessive heat
	STABLE	X	

INCOMPATIBILITY (Materials to avoid)

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Absorb with clay, diatomaceous earth, or other inert material.

WASTE DISPOSAL METHOD
Controlled burning in compliance with local regulations.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)
NIOSH-approved respirator to avoid exposure to hot vapor or mist.

VENTILATION	LOCAL EXHAUST: As required to prevent exposure to vapor or mist.	SPECIAL
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES: Oil resistant (rubber)

EYE PROTECTION: Goggles if oil is being sprayed or splashed.

OTHER PROTECTIVE EQUIPMENT
Appropriate clothing to avoid skin contact.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid breathing oil mist and vapors. Avoid skin contact.

OTHER PRECAUTIONS
Launder contaminated clothing before using. Discard leather goods when contaminated. Wash before eating or smoking.

Product Safety and Compliance
Oil and Chemical Products
Shell Oil Company

DATE September 1978

The petroleum hydrocarbons in this product contain a mixture of paraffinic, naphthenic, aromatic, and small amounts of heterocyclic hydrocarbons. As with other petroleum oils, the aromatics contain polycyclic compounds of various concentrations and structures. Some of these polycyclics may be those which have been shown to induce cancer in animals under laboratory conditions. Epidemiologic studies have suggested the possibility of skin cancer induction in man after prolonged and repeated contact with oils containing these materials under conditions of poor personal hygiene. Inhalation of mists arising from oils containing these materials may also present a cancer hazard.

ESS-I-SEE

CODE NO. 011

MATERIAL SAFETY DATA SHEET

SECTION 1. Product Identification

Manufacturer: Lava Crucible-Refractories Co.

Address: Box 278 , Zelienople PA 16063

Main Telephone Number: (412) 452-6050

Product Name, Sales Name or Trade Name: ESS-I-SEE 025

Product Type: Mullite-Bonded Silicon Carbide Fired Shape

SECTION 2. Hazardous Ingredients **

Chemical Name	Common Name	CAS Number	Per Cent	OSHA PEL	ACGIH TLV	Carcinogen (Y/N)

Since the product is a fired refractory shape, no toxic hazard exists. See Section 9 for personal protective equipment and procedures in handling.

** Per NTP, IARC or OSHA lists.

SECTION 3. Physical Data

Appearance: Gray, mottled solid shape Odor: None

Specific Gravity: 2.52 Melting Point: 1816°C/3300°F

Boiling Point: N/A Vapor Pressure: N/A

Evaporation Rate: N/A Solubility in H_2O: Insoluble

Solubility in Alcohol: N/A Other Solvents: N/A

Percent Volatile by Vol.: None Vapor Density: N/A

SECTION 4. Fire and Explosion Hazard Data

Flash Point (Method used): N/A

Flammable Limits: LEL N/A UEL N/A

Extinguishing Media: Product does not burn

Special Fire Fighting Procedures: N/A

Unusual Fire amd Explosion Hazards: None

C01383

SECTION 5. Health Hazard Data

Primary Routes of Entry	Exposure Symptoms	Emergency Procedures
Inhalation	N/A	
Ingestion	N/A	
Skin Contact and Absorption	N/A	
Eyes	N/A	
Other Potential Health Risks	None when used as intended.	

SECTION 6. Potential Exposure

When	Hazard Form
Removal from service	Dust

SECTION 7. Corrosivity and Reactivity Data

Stability: Stable

Incompatability (materials to avoid): N/A

Decomposition Products: None

Conditions to be Avoided: Breaking or cracking to produce dust

SECTION 8. Disposal Procedures

Spill or Leak Procedures: Collect and sweep up.

Waste Disposal Method: Sanitary landfill, in accordance with appropriate Federal, State and local regulations.

SECTION 9. Personal Protective Equipment/Procedures

Respiratory Protection: Mask Type: NIOSH or MSHA approved for dust

Ventilation-Local: N/A, unless dust is generated

Mechanical(General): N/A

Other: N/A

Protective Gloves: Abrasion resistant type

Eye Protection: Goggles for dust

Other Equipment: Safety shoes

Action to be taken during repair and maintenance of equipment that has been in contact with the product: None

---

SECTION 10. Special Precautions

During Storage: Keep dry

Other: None

SECTION 11. Preparation/Revision

Date: 11/14/85

NA = Not Applicable NE = Not Established NI = No Information or Test Data

DISCLAIMER

FREEPORT BRICK COMPANY

MATERIAL SAFETY DATA SHEET

Freeport 3000 (71)

DATE January 2, 1985

PURCHASE ORDER NO.	REQUISITION NO.	COMMODITY

SECTION I - NAME AND PRODUCT

MANUFACTURERS NAME: FREEPORT BRICK COMPANY

EMERGENCY TELEPHONE NO.: (412) 295-2111

ADDRESS: Mill Street, Drawer F., Freeport, Pa. 16229-0306

PERSON TO CONTACT: F. H. Laube

TRADE NAMES AND SYNONYMS
S. A.*

CHEMICAL COMPOSITION
Primarily alumina silicates, silica and clay in a water-sodium silicate suspension

CHEMICAL ANALYSIS
S.A.*

RECOMMENDED USE
High temperature resistant mortar

SECTION II - HAZARDOUS INGREDIENTS

	CAS NO.	%	OSHA PEL	ACGIH TLV
Paints, preservatives and solvents	N.A.	0	N.A.	N.A.
Alloy and metallic coatings	N.A.	0	N.A.	N.A.
RESPIRABLE DUST Free silica (crystalline)	14808-60-7	S.A.*	10 mg/m^3 % free silica+2	10 mg/m^3 %free silica+2

SECTION III - PHYSICAL DATA

Boiling point (°F)	212°	% volatile by weight (water) %	14-18
Solubility in solvents	N.A.	Specific Gravity	3.0

PHYSICAL APPEARANCE AND ODOR
Buff color, paste-like consistency, no odor

SECTION IV - FIRE, EXPLOSION & REACTIVITY DATA

FIRE AND EXPLOSION HAZARD	REACTIVITY WITH AIR, WATER AND HEAT
NONE	NONE
FLASH POINT	**CORROSIVE**
NONE	NO

C01384

* ...ached

cc E. Moore 5-13-85 (All Freeport #71)

SECTION V-HEALTH HAZARD DATA

POTENTIAL HAZARD This product contains free crystalline silica which is harmful only if reduced to respirable dust. When working with this product, minimize the creation and/or inhalation of dust. Prolonged exposure to the dust may increase the risk of silicosis and other serious respiratory diseases. If the material comes in contact with eyes it may cause irritation; immediately and thoroughly flush eyes with water; contact a physician if irritation persists.

SECTION VI-SPILL AND DISPOSAL PROCEDURE

INSTALLATION AND TEAROUT
Avoid inhalation of dust

DISPOSAL
Wash spilled mortar with water into a catch basin. Sediment from the catch basin may be disposed of in a landfill area.

SECTION VII-SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION Use with adequate ventilation. Where respiratory protection is indicated, OSHA or NIOSH approved respirators should be used. The selection of appropriate respiratory equipment should be based on the actual or potential airborne contaminants and their concentrations.

PROTECTIVE GLOVES	EYE PROTECTION
Suggested	Use of goggles recommended

SECTION VIII COMMENTS

The information and recommendations set forth herein are taken from sources believed to be accurate as of the date hereon. The information is given in good faith as authoritative and valid. However, the Freeport Brick Company makes no warranty with respect to the accuracy of the information or the suitability of the recommendations and assumes no liability to any user thereof.

TECHNICAL DATA - FREEPORT MORTAR

FREEPORT "3000"

Use Temperature	-	$3100^{\circ}F$
Pier Test @ $3000^{\circ}F$	-	No flow or deformation of joint

Modulus of Rupture as per A.S.T.M. C 198-76:

220°	F.	-	700 PSI (Std. Specs. 200 PSI min. ASTM C 178-47)
1500°	F.	-	100 PSI
2730°	F.	-	800 PSI
3000°	F.	-	Exceeds 3200 PSI (Joint Stronger than brick)

Lap Joint Strength as per A.S.T.M. C 606 -70

220°	F.	-	210 pounds (Std. Specs. 75 lbs. min.)
1500°	F.	-	130 pounds (Std. Specs. 75 lbs. min.)
2000°	F.	-	125 pounds (Std. Specs. 75 lbs. min.)
2500°	F.	-	Exceeds 60 pounds (Std. Specs. 20 lbs. min.)

APPROXIMATE CHEMICAL ANALYSIS

Silica	(SiO_2)	-	54.0 - 57.0%
Alumina	(Al_2O_3)	-	39.0 - 42.0
Ferric Oxide	(Fe_2O_3)	-	.8 - 1.0
Titania	(TiO_2)	-	1.0 - 1.5
Lime	(CaO)	-	.01- .02
Magnesia	(MgO)	-	.03- .05
Alkalies		-	2.7 - 3.2
Free Silica (crystalline)		-	15.0 - 20.0%

The above data is typical of FREEPORT "3000" Mortar. The data is subject to reasonable variations and therefore should not be used for Specification purposes.

FREEPORT BRICK COMPANY

MATERIAL SAFETY DATA SHEET

F.B.C. 30 mortar

DATE January 2, 1985

PURCHASE ORDER NO.	REQUISITION NO.	COMMODITY

SECTION I - NAME AND PRODUCT

MANUFACTURERS NAME	EMERGENCY TELEPHONE NO.
FREEPORT BRICK COMPANY	(412) 295-2111
ADDRESS	**PERSON TO CONTACT**
Mill Street, Drawer F., Freeport, Pa. 16229-0306	F. H. Laube

TRADE NAMES AND SYNONYMS

S. A.*

CHEMICAL COMPOSITION

Primarily alumina silicates, silica and clay in a water-sodium silicate suspension

CHEMICAL ANALYSIS

S.A.*

RECOMMENDED USE

High temperature resistant mortar

SECTION II - HAZARDOUS INGREDIENTS

	CAS NO.	%	OSHA PEL	ACGIH TLV
Paints, preservatives and solvents	N.A.	0	N.A.	N.A.
Alloy and metallic coatings	N.A.	0	N.A.	N.A.
RESPIRABLE DUST Free silica (crystalline)	14808-60-7	S.A.*	10 mg/m^3 % free silica+2	10 mg/m^3 %free silica+2

SECTION III - PHYSICAL DATA

Boiling point (°F)	212°	% volatile by weight (water) %	14-18
Solubility in solvents	N.A.	Specific Gravity	3.0

PHYSICAL APPEARANCE AND ODOR

Buff color, paste-like consistency, no odor

SECTION IV - FIRE, EXPLOSION & REACTIVITY DATA

FIRE AND EXPLOSION HAZARD	REACTIVITY WITH AIR, WATER AND HEAT
NONE	NONE
FLASH POINT	**CORROSIVE**
NONE	NO

*See attached

C01385

SECTION V-HEALTH HAZARD DATA

POTENTIAL HAZARD This product contains free crystalline silica which is harmful only if reduced to respirable dust. When working with this product, minimize the creation and/or inhalation of dust. Prolonged exposure to the dust may increase the risk of silicosis and other serious respiratory diseases. If the material comes in contact with eyes it may cause irritation; immediately and thoroughly flush eyes with water; contact a physician if irritation persists.

SECTION VI-SPILL AND DISPOSAL PROCEDURE

INSTALLATION AND TEAROUT
Avoid inhalation of dust

DISPOSAL
Wash spilled mortar with water into a catch basin. Sediment from the catch basin may be disposed of in a landfill area.

SECTION VII-SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION Use with adequate ventilation. Where respiratory protection is indicated, OSHA or NIOSH approved respirators should be used. The selection of appropriate respiratory equipment should be based on the actual or potential airborne contaminants and their concentrations.

PROTECTIVE GLOVES	EYE PROTECTION
Suggested	Use of goggles recommended

SECTION VIII COMMENTS

The information and recommendations set forth herein are taken from sources believed to be accurate as of the date hereon. The information is given in good faith as authoritative and valid. However, the Freeport Brick Company makes no warranty with respect to the accuracy of the information or the suitability of the recommendations and assumes no liability to any user thereof.

TECHNICAL DATA - FREEPORT MORTAR

F.B.C. 30 Mortar

Use Temperature-	3100°F
Pier Test at 3000°F.	No flow or deformation of joint
Modulus of Rupture as per A.S.T.M.	C 198-47

220° F	-	650 psi (Std. Specs. 200 psi min. ASTM C178-47)
1500° F	-	90 psi
2730° F	-	690 psi
3000° F	-	Exceeds 3200 psi (Joint stronger than brick)

Lap Joint Strength, as per A.S.T.M. C606-70:

220°F	-	200 pounds (Std. Specs. 75 lbs. min.)
1500°F	-	120 pounds (Std. Specs. 75 lbs. min.)
2000°F	-	125 pounds (Stds.Specs. 75 lbs. min.)
2500°F	-	Exceeds 60 pounds (Std. Specs. 20 lbs. min.)

APPROXIMATE CHEMICAL ANALYSIS

Silica	(SiO_2)	55.0 - 58.0%
Alumina	(Al_2O_3)	38.0 - 42.0
Ferric Oxide	(Fe_2O_3)	.9 - 1.1
Titania	(TiO_2)	.5 - 1.0
Lime	(CaO)	.02- .03
Magnesia	(MgO)	.04- .05
Alkalies		2.7 - 3.2
Free Silica (crystalline)		15.0 - 20.0%

The above data is typical of FBC 30 Mortar. The data is subject to reasonable variations and therefore should not be used for Specification purposes.

FREEPORT BRICK COMPANY

MATERIAL SAFETY DATA SHEET

Freeport 55

DATE January 2, 1985

PURCHASE ORDER NO.	REQUISITION NO.	COMMODITY

SECTION I - NAME AND PRODUCT

MANUFACTURERS NAME: FREEPORT BRICK COMPANY

EMERGENCY TELEPHONE NO.: (412) 295-2111

ADDRESS: Mill Street, Drawer F., Freeport, Pa. 16229-0306

PERSON TO CONTACT: F. H. Laube

TRADE NAMES AND SYNONYMS: S. A.*

CHEMICAL COMPOSITION: Primarily alumina silicates, silica and clay in a water-sodium silicate suspension

CHEMICAL ANALYSIS: S.A.*

RECOMMENDED USE: High temperature resistant mortar

SECTION II - HAZARDOUS INGREDIENTS

	CAS NO.	%	OSHA PEL	ACGIH TLV
Paints, preservatives and solvents	N.A.	0	N.A.	N.A.
Alloy and metallic coatings	N.A.	0	N.A.	N.A.
RESPIRABLE DUST Free silica (crystalline)	14808-60-7	S.A.*	10 mg/m^3 % free silica+2	10 mg/m^3 %free silica+2

SECTION III - PHYSICAL DATA

Boiling point (°F)	212°	% volatile by weight (water) %	14-18
Solubility in solvents	N.A.	Specific Gravity	3.0

PHYSICAL APPEARANCE AND ODOR: Buff color, paste-like consistency, no odor

SECTION IV - FIRE, EXPLOSION & REACTIVITY DATA

FIRE AND EXPLOSION HAZARD	REACTIVITY WITH AIR, WATER AND HEAT
NONE	NONE
FLASH POINT	**CORROSIVE**
NONE	NO

*See attached

C01386

SECTION V - HEALTH HAZARD DATA

POTENTIAL HAZARD This product contains free crystalline silica which is harmful only if reduced to respirable dust. When working with this product, minimize the creation and/or inhalation of dust. Prolonged exposure to the dust may increase the risk of silicosis and other serious respiratory diseases. If the material comes in contact with eyes it may cause irritation; immediately and thoroughly flush eyes with water; contact a physician if irritation persists.

SECTION VI - SPILL AND DISPOSAL PROCEDURE

INSTALLATION AND TEAROUT
Avoid inhalation of dust

DISPOSAL
Wash spilled mortar with water into a catch basin. Sediment from the catch basin may be disposed of in a landfill area.

SECTION VII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION Use with adequate ventilation. Where respiratory protection is indicated, OSHA or NIOSH approved respirators should be used. The selection of appropriate respiratory equipment should be based on the actual or potential airborne contaminants and their concentrations.

PROTECTIVE GLOVES	EYE PROTECTION
Suggested	Use of goggles recommended

SECTION VIII COMMENTS

The information and recommendations set forth herein are taken from sources believed to be accurate as of the date hereon. The information is given in good faith as authoritative and valid. However, the Freeport Brick Company makes no warranty with respect to the accuracy of the information or the suitability of the recommendations and assumes no liability to any user thereof.

Freeport 55

TYPICAL TECHNICAL DATA

FREEPORT 55 Mortar

Use Temperature — 3200° F.

Refractoriness Pier Test

As per A.S.T.M. C 199-72:

Pier Test @ 3100°F — No flow or deformation or joint

Cold Bonding Strength

As per A.S.T.M. C198-76:

220°F	800 - 950 psi (Std. Specs. 200 psi min.per ASTM C64-72)
2730°F	700 - 800 psi
3000°F	Exceeds 3000 psi (Joint stronger than brick)

Lap Joint Strength

As per A.S.T.M. C 606-70:

220°	Exceeds 250 pounds (Std. U.S.S.Specs. 75 lbs. min.)
1500°	Exceeds 175 pounds (Std. U.S.S.Specs. 75 lbs. min.)
2000°	Exceeds 150 pounds (Std. U.S.S. Specs.75 lbs. min.)
2500°	70 pounds (Std. U.S.S. Specs. 20 lbs. min.)

APPROXIMATE CHEMICAL ANALYSIS

Silica	(SiO_2)	38.0 - 42.0%
Alumina	(Al_2O_3)	54.0 - 56.0
Ferric Oxide	(Fe_2O_3)	.8 - 1.0
Titania	(TiO_2)	1.8 - 2.0
Lime	(CaO)	.01- .02
Magnesia	(MgO)	.03- .05
Alkalies		2.7 - 3.2
Free Silica (crystalline)		10.0 - 15.0%

The above data is typical of FREEPORT 55 Mortar. The data is subject to reasonable variations and therefore should not be used for Specification purposes.

FUEL OIL, #4

CLARK

MATERIAL SAFETY DATA SHEET

APEX

MSDS NUMBER

SECTION I MATERIAL IDENTIFICATION

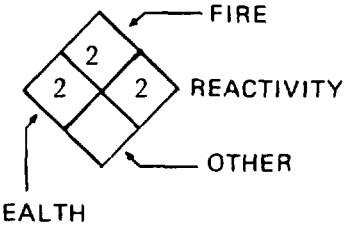
PRODUCT/ CHEMICAL NAME	No. 4 fuel oil
PRODUCT/ CHEMICAL SYNONYMS	Bunker fuel
CHEMICAL FAMILY/ FORMULA	Aromatic petroleum oil
OTHER IDENTIFICATION	
MATERIAL USE OR OCCURENCE	Industrial fuel oil

24 HOUR EMERGENCY INFORMATION

CLARK/APEX	314 - 889-9600
CHEMTREC	800 - 424-9300

HAZARDS:

4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = LEAST



SECTION II INGREDIENTS

COMPONENT	%	TLV (Units)	COMPONENT	%	TLV (Units)
Petroleum Heavy fraction consisting of a complex mixture of high molecular weight hydrocarbons. May contain polynuclear aromatic hydrocarbons.		Not established (recommended to maintain vapor concentrations below 0.2 mg/m^3 as benzene solubles.)			

SECTION III PHYSICAL DATA

BOILING POINT: 214 - 1092 °F 101 - 588 °C	MELTING POINT: Varies °F °C	VAPOR PRESSURE: Unknown mm Hg. @ °F °C
SPECIFIC GRAVITY (H_2O = 1 0.90 - 1.000 (liquid)	VOLATILE BY VOLUME: Not established %	VAPOR DENSITY: (AIR = 1) N/A
SOLUBILITY IN WATER Insoluble	EVAPORATION RATE: Not established (= 1)	

APPEARANCE AND ODOR:
Dark oily liquid, characteristic hydrocarbon odor, floats on water.

SECTION IV FIRE AND EXPLOSION DATA

FLASH POINT AND METHOD	IGNITION TEMPERATURE	FLAMMABLE LIMITS (%)	LEL	UEL
	Auto Ignition 505°F		1.0	5.0

EXTINGUISHING MEDIA
Dry Chemical, Foam, Carbon Dioxide

SPECIAL FIREFIGHTING PROCEDURES AND PRECAUTIONS:
Do not use foam at storage temperature above 200°F. Firemen fighting fuel oil fires should use necessary protective equipment and breathing apparatus as would normally be used when fighting fires where there may be danger of breathing hazardous products of combustion.

UNUSUAL FIRE AND EXPLOSION INFORMATION:
Water may be ineffective.

C01387

SECTION V — HEALTH INFORMATION

OSHA PEL	ACGIH TLV	ACTION LEVEL
Not established	Not established	Not established

HEALTH EFFECTS

	ACUTE	CHRONIC
INHALATION	Irritation or respiratory tract mucous membranes, nausea, CNS depression, pulmonary edema.	Irritation of respiratory tract mucous membranes, possible mild chemical pneumonitis with high concentrations.
INGESTION	Large quantities can result in nausea, CNS depression.	No known effects.
SKIN CONTACT	Irritation, particularly of mucous membranes.	Repeated and prolonged skin contact can result in skin disorders and potential sensitization.
EYE CONTACT	Irritation of the cornea and/or conjunctiva.	Irritation of the cornea and/or conjunctiva.

FIRST AID PROCEDURES ▶ INHALATION: Remove from vapor to fresh air, if unconscious seek medical aid. INGESTION: DO NOT INDUCE VOMITING, Seek medical aid. SKIN CONTACT: Promptly remove oil soaked clothing, wash skin with soap and water, if irritation develops, seek medical aid. EYE CONTACT: Flush with copious amount of water, if irritation develops, seek medical aid.

SECTION VI — REACTIVITY DATA

STABILITY		HAZARDOUS POLYMERIZATION	
☐ UNSTABLE	☒ STABLE	☐ MAY OCCUR	☒ WILL NOT OCCUR

CONDITIONS TO AVOID ▶ Source of ignition, heat, etc.

INCOMPATABLES ▶ Strong oxidants, e.g., chlorine and concentrated oxygen organic acid.

TYPICAL DECOMPOSITION PRODUCTS ▶ Incomplete combustion will produce carbon monoxide, organic acid and aldehydes.

SECTION VII — SPILL OR LEAK PROCEDURES

Avoid excessive inhalation or skin contact. Absorb, scrape up or incinerate under proper conditions or secure in a chemical land fill. Observe Federal, state and local governmental spill and water quality regulations. Contain spills by diking or impounding to prevent entrance into water courses and ground water.

SECTION VIII — SPECIAL PROTECTION AND CONTROL INFORMATION

VENTILATION	LOCAL EXHAUST ▶ Recommended where airborne concentrations exceed 0.2 mg/m^3 as benzene solubles.		
	GENERAL EXHAUST ▶ Recommended for use in enclosed or semi-enclosed work areas.		
PERSONAL PROTECTIVE EQUIPMENT	RESPIRATORY PROTECTION ▶ Combination particulate and vapor air purifying or self-contained breathing apparatus recommended at or above 0.2 mg/m^3 as benzene solubles.		
	GLOVES ▶ Butyl rubber, neoprene, polyethylene PVC	EYE PROTECTION ▶ Splash goggles or shield with safety glasses	OTHER ▶ Full body protective clothing.

SECTION IX — OTHER INFORMATION

The information contained herein is based on data available at this time and is believed to be accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Since information may be unfamiliar, no responsibility is assumed for the results of its use. The person receiving this information shall make his own determination of the suitability of the material for his particular purpose.

FUEL OIL, #5

CLARK

MATERIAL SAFETY DATA SHEET

APEX

MSDS NUMBER

SECTION I MATERIAL IDENTIFICATION

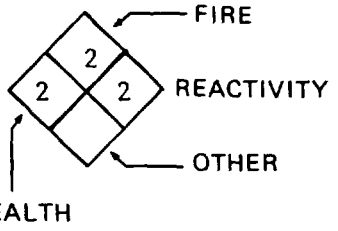
PRODUCT/ CHEMICAL NAME	No. 5 fuel oil
PRODUCT/ CHEMICAL SYNONYMS	Bunker fuel
CHEMICAL FAMILY/ FORMULA	Aromatic petroleum oil
OTHER IDENTIFICATION	
MATERIAL USE OR OCCURENCE	Industrial fuel oil

24 HOUR EMERGENCY INFORMATION

CLARK/APEX	314 - 889-9600
CHEMTREC	800 - 424-9300

HAZARDS:

4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = LEAST



SECTION II INGREDIENTS

COMPONENT	%	TLV (Units)	COMPONENT	%	TLV (Units)
Petroleum Heavy fraction consisting of a complex mixture of high molecular weight hydrocarbons. May contain polynuclear aromatic hydrocarbons.		Not established (recommended to maintain vapor concentrations below 0.2 mg/m^3 as benzene solubles.)			

SECTION III PHYSICAL DATA

BOILING POINT: 426 - 1062°F 218- 570 °C	MELTING POINT: Varies °F °C	VAPOR PRESSURE: Unknown mm Hg. @ °F °C
SPECIFIC GRAVITY (H_2O = 1 .9000	VOLATILE BY VOLUME: Not established %	VAPOR DENSITY (AIR = 1) N/A
SOLUBILITY IN WATER insoluble	EVAPORATION RATE (= 1) Not established	

APPEARANCE AND ODOR: Brown liquid, characteristic hydrocarbon odor

SECTION IV FIRE AND EXPLOSION DATA

FLASH POINT AND METHOD	IGNITION TEMPERATURE	FLAMMABLE LIMITS (%)	LEL	UEL
-130°F (C.C.)	N/A		1.0	5.0

EXTINGUISHING MEDIA

Dry chemical, foam, carbon dioxide

SPECIAL FIREFIGHTING PROCEDURES AND PRECAUTIONS

Do not use foam at storage temperature above 200°F. Firemen fighting fuel oil fires should use necessary protective equipment and breathing apparauts as would normally be used when fighting fires where there may be danger of breathing hazardous products of combustion.

UNUSUAL FIRE AND EXPLOSION INFORMATION

None.

SECTION V — HEALTH INFORMATION

OSHA PEL	ACGIH TLV	ACTION LEVEL
Not established	Not established	Not established

HEALTH EFFECTS

	ACUTE	CHRONIC
INHALATION	Irritation of respiratory tract mucous membranes, nausea, CNS depression, pulmonary edema.	Irritation of respiratory tract mucous membranes, possible mild chemical pneumonitis with high concentrations.
INGESTION	Large quantities can result in nausea, CNS depression.	No known effects.
SKIN CONTACT	Irritation, particularly of mucous membranes.	Repeated and prolonged skin contact can result in skin disorders and potential sensitization.
EYE CONTACT	Irritation of the cornea and/or conjunctiva.	Irritation of the cornea and/or conjunctiva.

FIRST AID PROCEDURES ▶ INHALATION: Remove from vapor to fresh air, if unconscious seek medical aid. INGESTION: DO NOT INDUCE VOMITING, seek medical aid. SKIN CONTACT: Promptly remove oil soaked clothing, wash skin with soap and water, if irritation develops, seek medical aid. EYE CONTACT: Flush with copious amounts of water, if irritation develops, seek medical aid.

SECTION VI — REACTIVITY DATA

STABILITY	HAZARDOUS POLYMERIZATION
☐ UNSTABLE ☒ STABLE	☐ MAY OCCUR ☒ WILL NOT OCCUR

CONDITIONS TO AVOID ▶ Source of ignition, heat, etc.

INCOMPATABLES ▶ Strong oxidants, e.g., chlorine and concentrated oxygen organic acid.

TYPICAL DECOMPOSITION PRODUCTS ▶ Incomplete combustion will produce carbon monoxide, aldehydes

SECTION VII — SPILL OR LEAK PROCEDURES

Avoid excessive inhalation or skin contact. Absorb, scrape up or incinerate under proper conditions or secure in achemical land fill. Observe Federal, state and local governmental spill and water quality regulations. Contain spills by diking or impounding to prevent entrance into water courses and ground water.

SECTION VIII — SPECIAL PROTECTION AND CONTROL INFORMATION

VENTILATION	LOCAL EXHAUST ▶ Recommended where airborne concentrations exceed 0.2 mg/m^3 as benzene solubles.		
	GENERAL EXHAUST ▶ Recommendedfor use in enclosed or semi-enclosed work areas.		
PERSONAL PROTECTIVE EQUIPMENT	RESPIRATORY PROTECTION ▶ Combination particulate and vapor air purifying or self-contained breathing apparatus recommended at or above 0.2 mg/m^3 as benzene solubles.		
	GLOVES ▶ Butyl rubber, neoprene, polyethylene PVC	EYE PROTECTION ▶ Splash goggles or shields with safety glasses.	OTHER ▶ Full body protective clothing.

SECTION IX — OTHER INFORMATION

The information contained herein is based on data available at this time and is believed to be accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Since information contained herein may be applied under conditions beyond our control and with which we may be unfamiliar, no responsibility is assumed for the results of its use. The person receiving this information shall make his own determination of the suitability of the material for his particular purpose.

FUEL OIL #6

CLARK

MATERIAL SAFETY DATA SHEET

APEX

MSDS NUMBER

SECTION I MATERIAL IDENTIFICATION

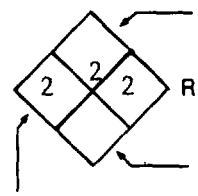
PRODUCT/ CHEMICAL NAME	No. 6 fuel oil
PRODUCT/ CHEMICAL SYNONYMS	Bunker fuel, coker charge
CHEMICAL FAMILY/ FORMULA	Aromatic petroleum oil
OTHER IDENTIFICATION	
MATERIAL USE OR OCCURENCE	Industrial fuel oil

24 HOUR EMERGENCY INFORMATION

CLARK/APEX	314 - 889-9600
CHEMTREC	800 - 424-9300

HAZARDS:

4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = LEAST



SECTION II INGREDIENTS

COMPONENT	%	TLV (Units)	COMPONENT	%	TLV (Units)
Petroleum Heavy fraction consisting of a complex mixture of high molecular weight hydrocarbons. May contain polynuclear aromatic hydrocarbons.		Not established (recommended to maintain vapor concentrations below 0.2 mg/m^3 as benzene solubles.)			

SECTION III PHYSICAL DATA

BOILING POINT 400-1200 °F 204-649 °C	MELTING POINT Varies °F °C	VAPOR PRESSURE unknown mm Hg. @ °F °C
SPECIFIC GRAVITY (H_2O = 1) 0.9402-1.000	VOLATILE BY VOLUME Not established %	VAPOR DENSITY (AIR = 1) N/A
SOLUBILITY IN WATER insoluble	EVAPORATION RATE (=1) Not established	

APPEARANCE AND ODOR

Amber to bronze color, heavy aromatic odor.

SECTION IV FIRE AND EXPLOSION DATA

FLASH POINT AND METHOD	IGNITION TEMPERATURE	FLAMMABLE LIMITS (%)	LEL	UEL
150° TOC	Auto ignition = 765°	Not established		

EXTINGUISHING MEDIA

Foam, carbon dioxide, dry chemical.

SPECIAL FIREFIGHTING PROCEDURES AND PRECAUTIONS

Do not use foam at storage temperatures above 200°F. Firemen fighting fuel oil fires should use necessary protective equipment and breathing apparatus as would normally be used when fighting fires where there may be danger of breathing hazardous products of combustion.

UNUSUAL FIRE AND EXPLOSION INFORMATION

None.

SECTION V — HEALTH INFORMATION

OSHA PEL ▶	ACGIH TLV ▶	ACTION LEVEL ▶
Not established	Not established	Not established

HEALTH EFFECTS

	ACUTE	CHRONIC
INHALATION	Irration of respiratory tract mucous membranes, nausea, CNS depression, pulmonary edema.	Irration of respiratory tract mucous membranes, possible mild chemical pneumonitis with high concentrations.
INGESTION	Large quantities can result in nausea, CNS depression.	No known effects.
SKIN CONTACT	Irritaion, particulary of mucous membranes.	Repeated and prolonged skin contact can result in skin disorders and potential sensitization.
EYE CONTACT	Irritation of the cornea and/or conjunctiva.	Irritation of the cornea and/or conjunctiva.

FIRST AID PROCEDURES ▶

INHALATION-remove from vapor to fresh air, if unconscious seek medical aid. INGESTION-DO NOT INDUCE VOMITING, seek medical aid. SKIN CONTACT-promptly remove oil soaked clothing, wash skin with soap and water, if irritation develops, seek medical aid. EYE CONTACT-flush with copious amounts of water, if irritation develops, seek medical aid.

SECTION VI — REACTIVITY DATA

STABILITY ▶		HAZARDOUS POLYMERIZATION ▶	
☐ UNSTABLE	☒ STABLE	☐ MAY OCCUR	☒ WILL NOT OCCUR

CONDITIONS TO AVOID ▶

Source of ignition, heat, etc.

INCOMPATABLES ▶

Strong oxidants, e.g., chlorine and concentrated oxygen.

TYPICAL DECOMPOSITION PRODUCTS ▶

Incomplete combustion will produce carbon monoxide, organic acids, aldehydes.

SECTION VII — SPILL OR LEAK PROCEDURES

Avoid excessive inhalation or skin contact. Absorb, scrape up, or incinerate under proper conditions or secure in a chemical land fill. Observe Federal, state and local governmental spill and water quality regulations. Contain spills by diking or impounding to prevent entrance into water courses and ground water.

SECTION IX — OTHER INFORMATION

VENTILATION	LOCAL EXHAUST ▶ Recommended where airborne concentrations exceed 0.2 mg/m^3 as benzene solubles.		
	GENERAL EXHAUST ▶ Recommended for use in enclosed or semi-enclosed work areas.		
PERSONAL PROTECTIVE EQUIPMENT	RESPIRATORY PROTECTION ▶ Combination particulate and vapor air purifying or self-contained breathing apparatus recommended at or above 0.2mg/m^3 as benzene solubles.		
	GLOVES ▶ Butyl rubber, neoprene, polyethylene, PVC	EYE PROTECTION ▶ Splash goggles or shields with safety glasses.	OTHER ▶ Full body protective clothing.

SECTION VIII — SPECIAL PROTECTION AND CONTROL INFORMATION

The information contained herein is based on data available at this time and is believed to be accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained form the use therof. Since informati[on] tained herein may be applied under conditions beyond our control and with shich we may be unfamiliar, no responsibility is assumed for the results of its use. The person receiving this information shall make his own determination of the suitability of the material for his particular purpose.

Gasoline, Unleaded

CLARK®

MATERIAL SAFETY DATA SHEET

APEX

MSDS NUMBER

SECTION I MATERIAL IDENTIFICATION

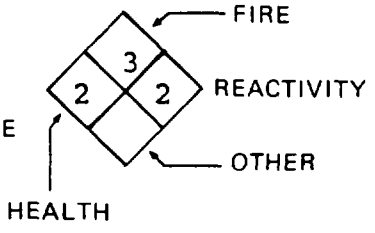
PRODUCT/ CHEMICAL NAME ▶	UNLEADED GASOLINE WITH ADDITIVES
PRODUCT/ CHEMICAL SYNONYMS ▶	NO LEAD
CHEMICAL FAMILY/ FORMULA ▶	Aliphatic and aromatic hydrocarbons/variable
OTHER IDENTIFICATION ▶	No lead
MATERIAL USE OR OCCURENCE ▶	Automotive Fuel

24 HOUR EMERGENCY INFORMATION

CLARK/APEX	314 - 889-9600
CHEMTREC	800 - 424-9300

HAZARDS:

4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = LEAST



SECTION II INGREDIENTS

COMPONENT	%	TLV (Units)	COMPONENT	%	TLV (Units)
Gasoline					
Complex mixture of aliphatic parafins, olefins, napthalenes, and aromatic hydrocarbons. May contain minute amounts (less than 3%) of benzene.	3%	300 ppm 10 ppm	(listed in the NTP Annual Report on Carcinogens)		
Additives:					
Ethanol	10%	1000 ppm			
Dupont DMA-54	1%				
Dupont AC-33-23	1%				
Ethyl PDA-733	1%				

SECTION III PHYSICAL DATA

BOILING POINT ▶ 75 - 437 °F 24 - 225 °C	MELTING POINT ▶ N/A °F °C	VAPOR PRESSURE ▶ 12 - 20psia mm Hg. @ 100 °F 38 °C
SPECIFIC GRAVITY ▶ (H_2O = 1) 0.7022 - 0.7587	VOLATILE BY VOLUME ▶ 98 - 100 %	VAPOR DENSITY ▶ (AIR = 1) 3.0 - 4.4
SOLUBILITY IN WATER ▶ insoluble	EVAPORATION RATE ▶ (= 1) not established	

APPEARANCE AND ODOR ▶

Clear color, characteristic hydrocarbon odor.

SECTION IV FIRE AND EXPLOSION DATA

FLASH POINT AND METHOD	IGNITION TEMPERATURE	FLAMMABLE LIMITS (%)	LEL	UEL
▶ -45 F -43 C	▶ 257 C Auto ignition = 495 F	▶	1.4	7.6

EXTINGUISHING MEDIA

Foam, carbon dioxide, dry chemical

SPECIAL FIREFIGHTING PROCEDURES AND PRECAUTIONS ▶

Firemen fighting gasoline fire should use necessary protective equipment and breathing apparatus as would be used when fighting fires where there may be danger of breathing hazardous products of combustion.

UNUSUAL FIRE AND EXPLOSION INFORMATION ▶

Highly dangerous when exposed to heat or flame.

SECTION V — HEALTH INFORMATION

OSHA PEL	ACGIH TLV	ACTION LEVEL
NONE	300ppm (1981 intended change)	150 ppm

HEALTH EFFECTS

	ACUTE	CHRONIC
INHALATION	Irritation of throat, respiratory tract Possible bronchopneumonia. CNS de-depressant, unconsciousness, coma	CNS depressant Liver, kidney, pancreas, and spleen damage.
INGESTION	May be aspirated into lungs causing chemical pneumonitis, pulminary edema hemmorage, loss of consciousness	Unknown
SKIN CONTACT	Skin irritant, possible allergen.	Skin irritant, defatting agent. Contact dermatitis may result.
EYE CONTACT	Conjunctiva irritant. Irritation of the eye surface membrane.	Conjunctiva irritant. Irritation of the eye surface membrane.

FIRST AID PROCEDURES

Inhalation-remove from vapor to fresh air, if unconscious seek medical aid. Ingestion- DO NOT INDUCE VOMITTING, seek medical aid. Skin Contact-remove gasoline soaked clothing, wash skin with soap and water, if irritation develops, seek medical aid. Eye Contact-flush with copious amounts of water, if irritation develops seek medical aid.

SECTION VI — REACTIVITY DATA

STABILITY	HAZARDOUS POLYMERIZATION
☐ UNSTABLE ☒ STABLE	☐ MAY OCCUR ☒ WILL NOT OCCUR

CONDITIONS TO AVOID: Source of ignition, heat, etc.

INCOMPATABLES: Can react vigorously with oxidizing materials.

TYPICAL DECOMPOSITION PRODUCTS: Carbon monoxide, oxides of nitrogen hydrocarbons. Incomplete combustion will produce carbon monoxide.

SECTION VII — SPILL OR LEAK PROCEDURES

Avoid excessive inhalation or skin contact. Absorb and secure in a chemical landfill. Observe Federal, state and local governmental spill and water quality regulations. Contain spills by diking or impounding to prevent entrance into water courses and ground water.

SECTION VIII — SPECIAL PROTECTION AND CONTROL INFORMATION

VENTILATION	LOCAL EXHAUST: Recommended where airborne concentrations exceed 300 ppm.		
	GENERAL EXHAUST: Recommended for use in enclosed or semi-enclosed work areas.		
PERSONAL PROTECTIVE EQUIPMENT	RESPIRATORY PROTECTION: Mask with organic vapor cartridge is recommended for concentrations above 300 ppm. Above 2000 ppm-self contained breathing unit.		
	GLOVES: Neoprene, PVC	EYE PROTECTION: Splash goggles or shields w/ safety glasses	OTHER:

SECTION IX — OTHER INFORMATION

The information contained herein is based on data available at this time and is believed to be accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Since information contai herein may be applied under conditions beyond our control and with which we may be unfamiliar, no responsibility is assumed for the results of its use. The person receiving this information shall make his own determination of the suitability of the material for his particular purpose.

Gasoline, Leaded

CLARK

MATERIAL SAFETY DATA SHEET

APEX

MSDS NUMBER

SECTION I MATERIAL IDENTIFICATION

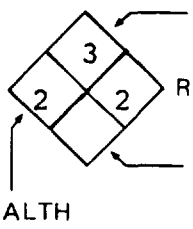
PRODUCT/ CHEMICAL NAME	Leaded Gasoline with additives
PRODUCT/ CHEMICAL SYNONYMS	Regular gasoline, Super Regular
CHEMICAL FAMILY/ FORMULA	Aliphatic and aromatic hydrocarbons
OTHER IDENTIFICATION	
MATERIAL USE OR OCCURENCE	Automotive Fuel

24 HOUR EMERGENCY INFORMATION

CLARK/APEX	314 - 889-9600
CHEMTREC	800 - 424-9300

HAZARDS:

4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = LEAST



SECTION II INGREDIENTS

COMPONENT	%	TLV (Units)	COMPONENT	%	TLV (Units)
Gasoline					
Complex mixture of aliphatic, parafins, oelfins, napthalenes, and aromatic hydrocarbons.		300 ppm			
May contain minute amounts (less than 3%) of benzene.	3%	10 ppm	(listed in the NTP Annual Report on Carcinogens)		
Additives:					
Ethanol	10%	1000 ppm			
Dupont DMA-54	1%				
Dupont AC-33-23	1%				
Ethyl PDA-733	1%				
Dupont orange dye	1%				
Alkyl Lead Compounds	1%				

SECTION III PHYSICAL DATA

BOILING POINT ▶ 75 - 437 °F 24 - 225 °C	MELTING POINT ▶ N/A °F °C	VAPOR PRESSURE ▶ 12-20psia mm Hg. @ 100 °F 38 °C
SPECIFIC GRAVITY ▶ (H_2O = 1 0.7022 - 0.7587	VOLATILE BY VOLUME ▶ 98 - 100%	VAPOR DENSITY ▶ (AIR = 1) 3.0 - 4.0
SOLUBILITY IN WATER ▶ insoluble	EVAPORATION RATE ▶ not established (= 1)	

APPEARANCE AND ODOR ▶ Amber to bronze color, characteristic hydrocarbon odor.

SECTION IV FIRE AND EXPLOSION DATA

FLASH POINT AND METHOD	IGNITION TEMPERATURE	FLAMMABLE LIMITS (%)	LEL	UEL
▶ -45 F -43 C	▶ Auto ignition 257 C 495 F	▶	1.4	7.6

EXTINGUISHING MEDIA

Foam, carbon dioxide, dry chemical.

SPECIAL FIREFIGHTING PROCEDURES AND PRECAUTIONS ▶

Firemen fighting gasoline fires should use necessary protective equipment and breathing apparatus as would normally be used when fighting fires where there may be danger of the breathing hazardous products of combustion.

UNUSUAL FIRE AND EXPLOSION INFORMATION ▶

Highly dangerous when exposed to heat or flame.

SECTION V — HEALTH INFORMATION

OSHA PEL ▶	ACGIH TLV ▶	ACTION LEVEL ▶
NONE	300 ppm (1981 intended change)	150 ppm

HEALTH EFFECTS

	ACUTE	CHRONIC
INHALATION	Irritation of throat, respiratory tract Possible bronchopneumonia. CNS depressant unconsciousness, possible coma	CNS depressant Liver, kidney, pancreas, and spleen damage.
INGESTION	May be aspirated into lungs causing chemical pneumonitis, pulmonary edema, hemorrage, loss of consciousness	Unknown
SKIN CONTACT	Skin irritant, possible allergen.	Skin irritant, defatting agent. Contact dermatitis may result.
EYE CONTACT	Conjunctiva irritant. Irritation of the eye surface membrane.	Conjunctiva irritant. Irritation of the eye surface membrane.

FIRST AID PROCEDURES ▶
Inhalation-remove from vapor to fresh air, if unconscious seek medical aid. Ingestion- DO NOT INDUCE VOMITTING, seek medical aid. Skin Contact-remove gasoline soaked clothing, wash skin with soap and water, if irritation develops, seek medical aid. Eye Contact-flush with copious amounts of water, if irritation develops, seek medical aid.

SECTION VI — REACTIVITY DATA

STABILITY ▶		HAZARDOUS POLYMERIZATION ▶	
☐ UNSTABLE	☒ STABLE	☐ MAY OCCUR	☒ WILL NOT OCCUR

CONDITIONS TO AVOID ▶
Source of ignition, heat, etc.

INCOMPATABLES ▶
Can react vigorously with oxidizing materials.

TYPICAL DECOMPOSITION PRODUCTS ▶ Carbon monoxide, oxides of notrogen, hydrocarbons. Incomplete combustion will produce carbon monoxide.

SECTION VII — SPILL OR LEAK PROCEDURES

Avoid excessive inhalation or skin contact. Absorb and secure in a chemical landfill. Observe Federal, state, and local governmental spill and water quality regulations. Contain spills by diking or impounding to prevent entrance into water courses and ground water.

SECTION VIII — SPECIAL PROTECTION AND CONTROL INFORMATION

VENTILATION	LOCAL EXHAUST ▶ Recommended where airborne concentrations exceed 300 ppm		
	GENERAL EXHAUST ▶ Recommended for use in enclosed or semi-enclosed work areas.		
PERSONAL PROTECTIVE EQUIPMENT	RESPIRATORY PROTECTION ▶ Mask w/organic vapor cartridge is recommended for concentrations above 300 ppm. Above 2000 ppm use self contained breathing unit		
	GLOVES ▶ Neoprene, PVC	EYE PROTECTION ▶ Splash goggles or shields w/safety glasses	OTHER ▶

SECTION IX — OTHER INFORMATION

The information contained herein is based on data available at this time and is believed to be accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Since information conta herein may be applied under conditions beyond our control and with which we may be unfamiliar, no responsibility is assumed for the results of its use. The person receiving this information shall make his own determination of the suitability of the material for his particular purpose.

Graphite

M.G.P., INC.

1800 CONRAD WEISER PARKWAY
WOMELSDORF, PA 19567
215–589-2541

PRODUCT:
Carbon/Graphite Grades

November, 1985

I IDENTIFICATION

CHEMICAL FAMILY: Carbon
D.O.T. HAZARD CLASSIFICATION: Inert

II INGREDIENTS (INERT & HAZARDOUS)

INGREDIENTS/COMPOSITION	C.A.S. #	PERCENT	PEL	TLV
Carbon	7440-44-0	>99	15 mg/M³	10mg/M³
and/or	or			
Synthetic Graphite	7782-42-5			

III PHYSICAL DATA

BOILING POINT: None
MELTING POINT: None
EVAPORATION RATE: 0
SOLUBILITY IN WATER: Insoluble
APPEARANCE: Grey-black solid
VOLATILE BY WEIGHT: <0.01%
SPECIFIC GRAVITY: 1.9-2.2
VAPOR PRESSURE: Negligible at room temp.
VAPOR DENSITY: Negligible at room temp.
ODOR: None

IV FIRE AND EXPLOSION DATA

FLASH POINT: None
LOWER/UPPER EXPLOSIVE LIMIT: None
EXTINGUISHING MEDIA: Water, CO_2, sand
EXTINGUISHING MEDIA TO **AVOID**: None
HAZARDOUS DECOMPOSITION PRODUCTS: In normal combustion, CO_2 and CO.
SPECIAL FIREFIGHTING PROCEDURES: Self-contained breathing apparatus, as normal.
UNUSUAL FIRE AND EXPLOSION DATA: Graphite and carbon dusts are normally not explosive, but these may weakly contribute if the event is initiated by another explosive dust or gas. Graphite and carbon dusts are electrically conductive; dust accumulations may cause electrical short circuits or other electrical malfunctions.

V HEALTH HAZARD DATA

PERMISSIBLE EXPOSURE LIMIT (PEL): SEE SECTION II
PRIMARY ROUTE(S) OF ENTRY: Inhalation of dust.
EFFECTS OF OVEREXPOSURE:
EYES: At high dust level, mechanical irritation.
BREATHING: Prolonged and repeated over-exposure may lead to benign pneumoconiosis.
SWALLOWING or SKIN: No effect.
FIRST AID:
IF IN EYES: Flush with water if irritation occurs.
IF ON SKIN, BREATHED OR SWALLOWED: None necessary.
MEDICAL CONDITIONS RECOGNIZED AS POSSIBLY AGGRAVATED BY EXPOSURE:
Individuals with pre-existing chronic respiratory impairments or with serum antitrypsin deficiency may be at increased risk of pneumoconiosis.

VI REACTIVITY DATA

HAZARDOUS POLYMERIZATION: Will not occur.
STABILITY: Stable.
INCOMPATIBILITY (MATERIALS TO AVOID): None known.

VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
Use normal housekeeping practice.
WASTE DISPOSAL METHOD: Bury in an approved landfill.
DISPOSAL MUST BE IN COMPLIANCE WITH FEDERAL, STATE & LOCAL LAWS AND REGULATIONS.

VIII PROTECTIVE EQUIPMENT TO BE USED

RESPIRATORY PROTECTION: Use approved respirator if exposure exceeds PEL limits.
VENTILATION: Local ventilation recommended if dust level exceeds PEL limit.
PROTECTIVE GLOVES: Not required.
EYE PROTECTION: If airborne particles are produced.
OTHER PROTECTIVE EQUIPMENT: None required.

IX SPECIAL PRECAUTIONS OR OTHER COMMENTS

None

X REFERENCES

ACGIH Documentation of Threshold Limit Values, current edition
NIOSH Occupational Health Guidelines
OSHA Publication 2206 (29 CFR 1910.1000)

K/R Gun 60RG
(Formerly BG 633-2)

NATIONAL REFRACTORIES & MINERALS CORPORATION

300 LAKESIDE DRIVE, OAKLAND, CALIFORNIA 94643

MATERIAL SAFETY DATA SHEET

Company / Plant	Issue Date	Identification Number
National Refractories and Minerals Corporation	Revised 1-30-85	NA
Trade Name (Common Name or Synonym) K/R Gun 60RG(Formerly BG 633-2)	**Emergency Phone Number** (415) 462-1122	
Chemical Name NA	**Formula** NA	**DOT Identification Number** NA

HAZARDOUS INGREDIENTS

Material or Component

Trivalent Chromium (Cr^{+3} as in Cr_2O_3): <13, Typical (CAS 007440-47-3)

Sodium Silicate : <5, Typical (CAS 015593-82-5)

Gypsum, $CaSO_4 \cdot 2H_2O$: <5, Typical (CAS 013397-24-5)

PHYSICAL DATA

Material is (At Normal Conditions)	Appearance and Odor			
☐ Liquid ☐ Solid ☐ Gas ☐ Other Granular, Dry	Color: Dark Grey Odor: None Sizing: -4 mesh			
Acidity/Alkalinity pH NA	Melting Point NA° F Boiling Point NA° F	Specific Gravity (H_2O = 1) 2.8-3.1 Solubility in water (% by weight) <6		**Vapor Pressure** (mm Hg at 20°C) NA

PERSONAL PROTECTIVE EQUIPMENT

Respiratory Protection	Hands, Arms, and Body
NIOSH or MSHA approved respirator for particulates.	Long sleeved shirt and gloves are recommended.
Eyes and Face	**Other Clothing and Equipment**
Safety glasses are recommended.	Shoe covers; Rubber or plastic booties.

EMERGENCY MEDICAL PROCEDURES

Unused Product:

1. Skin: Wash with soap and water. Rinse thoroughly.
2. Eyes: Wash immediately with large quantities of water. Obtain medical attention.

Used Product may contain hexavalent chromium compounds.

1. Skin: Wash with soap or mild detergent in running water. Remove contaminated clothing.
2. Eyes: Irrigate immediately with water lifting lower and upper lids occasionally. Continue for 15 minutes. Get medical attention.

HEALTH/SAFETY INFORMATION

Health

Inhalation: Long term exposure to trivalent chromium appears to have no significant health effect. Hexavalent chromium compounds, potentially present in used products. are severe irritants of the respiratory tract and skin and repeated prolonged exposure may increase the risk of lung cancer.

Ingestion: Not likely to occur.

Skin: Repeated or prolonged contact with potentially hazardous used product may cause sensitization dermatitis.

Eyes: Contact with unused or potentially hazardous used product, may be corrosive to tissues. (See Additional Information section).

Threshold Limit Value: 0.5 mg/m^3 Cr^{+3}; 0.05 mg/m^3 Cr^{+6} 1983-84 ACGIH TLV's

Fire and Explosion

Flash Point	Auto Ignition Temperature	Flammable Limits in Air	Extinguishing Media
NA °F ☒ ☐ Not Flammable	NA °F	Lowe NA % Uppe NA %	NA

Unusual Fire and Explosion Hazards: NA

Extinguishing Media Not to be Used: NA

Reactivity

Stability: ☒ Stable ☐ Unstable

Incompatibility (Materials to Avoid): NA

Conditions to Avoid: NA

Hazardous Decomposition Products: See Environmental Section

ENVIRONMENTAL

Spill or leak procedures

The used product may release hexavalent chromium if wetted. We recommend that the purchaser establish a spill prevention, control and counter measure plan. This plan should include procedures for proper storage as well as clean-up of spills and leaks. The procedures should conform to safe practices and provide for proper recovery or disposal. Depending on the quantity spilled, notification of the National Response Center(800-424-8802) may be required in case of hazardous substances.(See EPA and DOT Regulations, also, various state and local regulations.)

Waste Disposal Method*

Before disposal, used or unused product should be tested to determine hazard and requirements under Federal, State or Local laws and regulations.

*Disposer must comply with Federal, State and Local disposal or discharge laws.

ADDITIONAL INFORMATION

1. Do not breathe dust.
2. Toxic risk may be altered by chemical or physical changes caused by conditions of use.
3. K/R Gun 60 RG is a chemically bonded Refractory Castable.

MAY 12 1983 (19)

Kast-o-Lite 25

MATERIAL SAFETY DATA SHEET

A.P. GREEN REFRACTORIES COMPANY
Green Boulevard, Mexico, Missouri 65265
Tel. 314-473-3626

Product Name: KAST-O-LITE 25

Product Type: Fireclay Insulating Castable

Product Chemical Analysis:

SiO_2	37.0 - 41.0%
Al_2O_3	35.0 - 39.0
Fe_2O_3	4.5 - 8.0
CaO	14.0 - 16.0
MgO	0.3 - 0.8
TiO_2	1.0 - 2.0
NaKO	1.2 - 1.7

Product Proximate Analysis (Ingredients):

Insulating Brick Grog	10 to 20%
Firebrick Grog	30 to 40
Clay	1 to 6
Perlite	3 to 10
Refractory Cement	35 to 45
Diatomaceous Earth	1 to 5
Amorphous Silica	3 to 10

Potential Health Hazard Data:

1. This product contains 0 to 1% quartz. It also probably contains 3 to 12% cristobalite contributed by the calcines. This cristobalite would occur in the glassy bond of the product's grog and the cristobalite crystallites are not machanically separate unless the product is ground extremely fine.

2. This product's cement may cause drying out and chapping of the skin, and will irritate the eyes if it enters them.

Recommended Disposal Method:

1. Normal housekeeping procedures should be followed in the event of spilled castable.

2. Waste material may be removed to an approved landfill or dump.

Recommended Handling Procedures:

1. Wear standard safety glasses.

2. Avoid breathing of dust while handling dry material.

3. Wear gloves to protect hands from chapping.

4. In case of contact with skin or eyes the contacted area should be washed thoroughly with water.

5. Safety shoes may be worn to protect feet from dropped containers.

6. Avoid breathing of dust during refractory tear-out after service.

This material safety data sheet contains confidential proprietary information and is not to be disclosed to the general public or to competition. The information accumulated herein is believed to be accurate but is not warranted to be, whether originating with A. P. Green Refractories or not. This information is offered solely for use in your evaluation of this product in respect to safety, health and environmental hazards.

Kermac 467 Solvent

TRIANGLE REFINERIES, INC.
SPECIALTY PRODUCTS DIVISION
3020 KNIGHT STREET • SUITE 130 • SHREVEPORT, LOUISIANA 71105
TELEPHONE (800) 548-3417 (318) 861-0954
A SUBSIDIARY OF KERR-McGEE REFINING CORPORATION

MATERIAL SAFETY DATA SHEET

MSDS NUMBER: CV-1354

EMERGENCY TELEPHONE	COMPANY	CHEMTREC
	405/270-2526	800/424-9300

I. PRODUCT IDENTIFICATION

PRODUCT	CHEMICAL NAME	
KERMAC 467 Solvent	Heavy Aliphatic Solvent Naphtha	
CHEMICAL FAMILY	**FORMULA**	**CAS NUMBER**
Petroleum Hydrocarbon Distillate	C_{10}-C_{16}	64742-96-7

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATING CODES	HEALTH CODE	FIRE CODE	REACTIVITY CODE
Least - 0 Slight - 1 Moderate - 2 High - 3 Extreme - 4	0	2	0

II. HAZARDOUS COMPONENTS

INGREDIENT	%	OSHA LIMIT	TLV
Solvent - Similar to Kerosine	100	Petroleum Distillate TWA-500 ppm	Not Applicable

III. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT	VAPOR PRESSURE	EVAPORATION (ETHYL ETHER = 1)
390-470°F	<1 mmHg @ 100°F	Slower
PERCENT VOLATILE BY VOLUME (%)	**MOLECULAR WEIGHT**	**APPEARANCE**
00	172	Clear Liquid
...R AND THRESHOLD	**MELTING POINT**	**VAPOR DENSITY (AIR = 1)**
Kerosine	Not Available	5.9
SPECIFIC GRAVITY (H_2O = 1)	**VISCOSITY**	**SOLUBILITY (G/100G WATER AT 20 °C)**
0.78	<32 SUS @ 100°F	Negligible

IV. FIRE PROTECTION INFORMATION

FLASH POINT AND METHOD	AUTOIGNITION TEMPERATURE	FLAMMABLE LIMITS % VOLUME IN AIR	LOWER	UPPER
Tag Closed Cup 160°F minimum	410°F		0.7	5

EXTINGUISHING MEDIA

Carbon dioxide, dry chemical, or foam. Water stream may spread fire, use water spray only to cool containers exposed to fire. If leak or spill has not ignited, use water spray to disperse vapors.

HAZARDOUS DECOMPOSITION PRODUCTS

Incomplete combustion can yield carbon monoxide and various hydrocarbons.

FIRE AND EXPLOSION HAZARDS

Can form combustible mixtures with air when heated to approximately 160°F. Will not flash spontaneously.

HAZARDOUS POLYMERIZATION		STABILITY	
☒ Will Not Occur	☐ May Occur	☒ Stable	☐ Unstable

V. HEALTH INFORMATION

INHALATION

Possible effects include headache, nasal and respiratory irritation, nausea, drowsiness, fatigue, peumonitis, pulmonary edema, central nervous system depression.

EYE CONTACT

Irritation

SKIN CONTACT

Irritation, may cause dermatitis due to defatting of keratin layer.

INGESTION

Possible effects include headache, drowsiness, nausea, fatigue, peumonitis, pulmonary edema, central nervous system depression. Aspiration hazard.

REPORTED AS POTENTIAL CARCINOGEN OR CARCINOGEN		
☒ Not Applicable	☐ National Toxicology Program	
☐ International Agency for Research on Cancer	☐ OSHA	

VI. FIRST AID PROCEDURES

INHALATION

Move exposed person to fresh air. If breathing has stopped, perform artificial respiration. Get medical attention as soon as possible.

EYE CONTACT

Immediately flush eyes with water for a minimum of 15 minutes, occasionally lifting the lower and upper lids. Get medical attention as soon as possible.

SKIN CONTACT

If clothing soaked, immediately remove clothing and wash skin with soap and water. Launder clothing before wearing. Get medical attention promptly.

INGESTION

Do not induce vomiting. Get medical attention as soon as possible.

VII. EMPLOYEE PROTECTION

RESPIRATORY PROTECTION (UTILIZE NIOSH APPROVED RESPIRATORS. REFER TO MANUFACTURER'S PROTECTION FACTORS AND OSHA STANDARD 1910.134. AS A GUIDELINE:)

Up to 2500 ppm, half-mask organic vapor respirator.
Up to 5000 ppm, full-face organic vapor respirator or full-face supplied air respirator.
Greater than 5000 ppm, fire fighting, or unknown concentration, self-contained breathing apparatus with positive pressure.

PROTECTIVE CLOTHING		
	EYE	Chemical goggles, face shield.
	SKIN	Gloves: Nitrile, neoprene or other material resistant to petroleum distillate.

VENTILATION

Maintain local or dilution ventilation to keep air concentration below 500 ppm. Loading, unloading, tank gauging, etc. remain upwind. Request assistance of safety and industrial hygiene personnel to determine air concentrations.

VIII. TRANSPORTATION AND STORAGE INFORMATION

DOT Hazardous Material ☒ Yes ☐ No

DOT SHIPPING NAME AND NUMBER: Petroleum naphtha UN 1255

DOT HAZARD CLASS: Combustible liquid

STORAGE

Do not store with strong oxidizers. Store as OSHA Class IIIA combustible liquid.

IX. ENVIRONMENTAL PROTECTION

SPILLS

Notify emergency response personnel. Evacuate area and remove ignition sources. Build dike to contain flow. Remove free liquid, do not flush to sewer or open water. Pick up, with inert absorbent and place in closed container for disposal.

WASTE DISPOSAL

EPA Hazardous Waste ☐ Yes ☒ No

EPA WASTE CODE NUMBER: Not applicable

WASTE CHARACTERISTIC OR HAZARD CODE: Not applicable

Utilize licensed waste disposal company. Consider recycling or incineration. Utilize permitted industrial waste disposal site.

MANAGER'S SIGNATURE (PRODUCT SAFETY AND COMPLIANCE)

Prepared by Kerr-McGee Refining Corporation for Triangle Refineries, Inc. C.L. Russell

DATE PREPARED: 5-15-85

DISCLAIMER

Lube-a-tube
Hot Extrusion #230
FHM

MATERIAL SAFETY DATA SHEET

PRODUCT NAME:
LUBE-A-TUBE HOT EXTRUSION #230-FHM

EMERGENCY PHONE
(215) 487-0697

G. WHITFIELD RICHARDS COMPANY
4202-10 MAIN STREET, PHILADELPHIA, PA 19127 - (215)487-1202

MATERIAL DESCRIPTION AND SHIPPING NAME:
SHIPPED AS "METAL CUT/DRAW LUBRICANT"

PRODUCT NUMBER:
309999

SECTION II - HAZARDOUS INGREDIENTS	TLV UNITS	CAS REGISTRY #	%
GRAPHITE (DUST IS FIRE HAZARD & IRRITANT)	2.5 mg/m3 RESPIRABLE DUST	7782-42-5	65

SECTION III - NONHAZARDOUS INGREDIENTS	CAS REGISTRY #	%
PETROLEUM HYDROCARBON	64741-45-3	<30
FATTY OIL	8016-28-2	<15
COLLOIDAL CLAY	12001-31-9	<10

CONFIDENTIAL PROPRIETARY INFORMATION
AND FOR INTERNAL USE ONLY

SECTION IV - PHYSICAL DATA

BOILING POINT: HIGH WITH WIDE RANGE
SPECIFIC GRAVITY: 1.3
VAPOR PRESSURE: N/A
EVAPORATION RATE: N/A
VAPOR DENSITY (AIR=1): N/A
SOLUBILITY IN WATER: NIL
APPEARANCE AND ODOR: BLACK GREASE - OILY ODOR

SECTION V - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: 555 DEGREES F
FLAMMABLE LIMITS: UNKNOWN
EXTINGUISHING MEDIA: FOAM, CARBON DIOXIDE, DRY CHEMICAL
SPECIAL FIRE FIGHTING PROCEDURES: WEAR SELF-CONTAINED BREATHING APPARATUS WHEN FIRE FIGHTING IN CONFINED SPACES.

UNUSUAL FIRE AND EXPLOSION HAZARDS: NONE

SECTION VI - HEALTH HAZARD DATA

EFFECTS OF OVEREXPOSURE:
CASES OF PULMONARY FIBROSIS AND EMPHYSEMA HAVE RESULTED FROM PROLONGED INHALATION OF GRAPHITE DUST.

THRESHOLD LIMIT VALUE
NOT ESTABLISHED

EMERGENCY AND FIRST AID PROCEDURES:
SKIN - WASH WITH SOAP AND WATER. EYES - FLUSH WITH WATER. IF IRRITATION OCCURS AND PERSISTS, SEEK MEDICAL AID.

SECTION VII - REACTIVITY DATA

STABILITY: STABLE

INCOMPATIBILITY (MATERIALS TO AVOID): STRONG OXIDIZING AGENTS

HAZARDOUS DECOMPOSITION PRODUCTS: FUMES, SMOKE, CARBON MONOXIDE, SULFUR OXIDES, ALDEHYDES AND OTHER DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

SECTION VIII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED:
SCOOP UP OR COLLECT FOR WASTE CONTAINERS. PREVENT MATERIAL FROM ENTERING WATERWAY.

WASTE DISPOSAL METHOD:
DISPOSE ACCORDING TO LOCAL, STATE AND FEDERAL REGULATIONS.

SECTION IX - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION: USE AIR-SUPPLIED RESPIRATORY PROTECTION IN CONFINED OR ENCLOSED SPACES

VENTILATION: SUGGESTED TO CAPTURE VAPOR MISTS OR FUMES

PROTECTIVE GLOVES:
S ESTED TO AVOID PROLONGED CONTACT WITH SKIN

EYE PROTECTION:
SUGGESTED

OTHER PROTECTIVE EQUIPMENT: NONE

SECTION X - SPECIAL PRECAUTIONS

PRECAUTIONS IN HANDLING AND STORING: WASH THOROUGHLY AFTER HANDLING.

NAME: S. P. BARATTA

SIGNATURE: 

T E: V. P. - TECHNICAL DEVELOPMENT

DATE: JUNE, 1986

309999

Copy to Atty 6-25-81

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

MASTER DRAW 595P (64)

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
ETNA PRODUCTS, INC.	216/543-9845

ADDRESS (Number, Street, City, State, and ZIP Code)
16824 Park Circle Drive, PO Box 286, Chagrin Falls, Ohio 44022 U.S.A.

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
	MASTER DRAW #595P
CHEMICAL FAMILY	FORMULA

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	above 400°F	SPECIFIC GRAVITY (H_2O=1)	0.87
VAPOR PRESSURE (mm Hg.)	Nil	PERCENT, VOLATILE BY VOLUME (%)	Nil
VAPOR DENSITY (AIR=1)	Nil	EVAPORATION RATE (_____=1)	Nil
SOLUBILITY IN WATER	Insoluble		
APPEARANCE AND ODOR	Free flowing amber liquid, bland odor.		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
340°F COC			

EXTINGUISHING MEDIA
Dry chemical or CO_2.

SPECIAL FIRE FIGHTING PROCEDURES
Keep unopened drums cool with water.

Use air-supplied rescue equipment for enclosed areas.

UNUSUAL FIRE AND EXPLOSION HAZARDS

None known.

(Continued on reverse side)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	None known
EFFECTS OF OVEREXPOSURE	Prolonged contact may cause mild irritation.
EMERGENCY AND FIRST AID PROCEDURES	Wash skin with soap and water. If liquid comes in contact with eyes, flush with cold water until irritation subsides.

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE	CONDITIONS TO AVOID
	STABLE	XX
INCOMPATABILITY (Materials to Avoid)	Strong oxidizing agents	
HAZARDOUS DECOMPOSITION PRODUCTS	none known.	
HAZARDOUS POLYMERIZATION	MAY OCCUR	CONDITIONS TO AVOID
	WILL NOT OCCUR	XX

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Keep liquid out of water and sewage systems. Cover free liquid and use suitable absorbent.
WASTE DISPOSAL METHOD	Dispose of in accordance with Local Ordinances.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)	Usually not needed	
VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL (General)	OTHER
	Usually not needed	
PROTECTIVE GLOVES	EYE PROTECTION	Safety Glasses
OTHER PROTECTIVE EQUIPMENT		

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Store away from open flame and extreme heat.
OTHER PRECAUTIONS	

GPO 930-88.

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

(61)

MASTER DRAW 2555P

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
ETNA PRODUCTS, INC.	216/543-9845

ADDRESS (Number, Street, City, State, and ZIP Code)
16824 Park Circle Drive, PO Box 286, Chagrin Falls, Ohio 44022 U.S.A.

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
	MASTER DRAW #2555P
CHEMICAL FAMILY	FORMULA

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	> 400°F	SPECIFIC GRAVITY (H_2O=1)	0.858
VAPOR PRESSURE (mm Hg.)	Nil	PERCENT, VOLATILE BY VOLUME (%)	Nil
VAPOR DENSITY (AIR=1)	Nil	EVAPORATION RATE (_____ =1)	---
SOLUBILITY IN WATER	Insoluble		
APPEARANCE AND ODOR			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
420°F ASTM D-92-57			

EXTINGUISHING MEDIA
Dry chemical or CO_2.

SPECIAL FIRE FIGHTING PROCEDURES
Keep unopened drums cool with water.

Use air-supplied rescue equipment for enclosed areas.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Do not mix with strong oxidants.

(Continued on reverse side)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	5 mg/m^3 for oil mist
EFFECTS OF OVEREXPOSURE	Prolonged or repeated skin contact may cause mild skin irritation.
EMERGENCY AND FIRST AID PROCEDURES	
	SKIN CONTACT: wash with soap and water.
	EYE CONTACT: flush with clear water until irritation subsides.

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATABILITY *Materials to avoid*	Strong oxidants		
HAZARDOUS DECOMPOSITION PRODUCTS			
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED	Recover free liquid. Add inert absorbent to spill area.
	Keep petroleum products out of streams and waterways.
WASTE DISPOSAL METHOD	Dispose of in accordance with the Federal, State and Local
	Ordinances.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *Specify type*	Chemical Mist, such as Willson 1211	NIOSH Approval No. TC 21C - 141
VENTILATION	LOCAL EXHAUST: Needed only to capture hot fumes.	SPECIAL
	MECHANICAL *(General)*	OTHER
PROTECTIVE GLOVES	Impervious material if desired	EYE PROTECTION: Chemical safety goggles
OTHER PROTECTIVE EQUIPMENT	Impervious apron if desired	

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING	Keep container closed when not in use. Do not store near
	heat, open flame or strong oxidants.
OTHER PRECAUTIONS	Avoid eye contact and prolonged skin contact. Avoid
	breathing oil mist. Wash thoroughly after handling.

GPO 934-990

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1367

(63)

MASTER DRAW 548SG1

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
ETNA PRODUCTS, INC.	216/543-9845

ADDRESS (Number, Street, City, State, and ZIP Code)
16824 Park Circle Drive, PO Box 286, Chagrin Falls, Ohio 44022 U.S.A

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
	MASTER DRAW #548SG1
CHEMICAL FAMILY	FORMULA

SECTION II - HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	above 420°F	SPECIFIC GRAVITY (H_2O=1)	0.87
VAPOR PRESSURE (mm Hg.)	Nil	PERCENT, VOLATILE BY VOLUME (%)	Nil
VAPOR DENSITY (AIR=1)	Nil	EVAPORATION RATE (_____ =1)	Nil
SOLUBILITY IN WATER	Insoluble		
APPEARANCE AND ODOR			

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
400°F COC			

EXTINGUISHING MEDIA
CO_2 or dry chemical.

SPECIAL FIRE FIGHTING PROCEDURES
Keep unopened drums cool with water.
Use air-supplied rescue equipment for enclosed areas.

UNUSUAL FIRE AND EXPLOSION HAZARDS

(Continued on reverse side)

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: None known

EFFECTS OF OVEREXPOSURE: Prolonged contact may cause mild irritation.

EMERGENCY AND FIRST AID PROCEDURES: Wash skin with soap and water. If liquid comes in contact with eyes, flush with cold water until irritation subsides.

SECTION VI - REACTIVITY DATA

STABILITY	UNSTABLE	CONDITIONS TO AVOID
	STABLE	XX

INCOMPATABILITY (Materials to Avoid): Strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS: none known.

HAZARDOUS POLYMERIZATION	MAY OCCUR	CONDITIONS TO AVOID
	WILL NOT OCCUR	XX

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Keep liquid out of water and sewage systems. Cover free liquid and use suitable absorbent.

WASTE DISPOSAL METHOD: Dispose of in accordance with Local Ordinances.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type): Usually not needed

VENTILATION: LOCAL EXHAUST: Usually not needed; SPECIAL; MECHANICAL (General); OTHER

PROTECTIVE GLOVES:

EYE PROTECTION: Safety Glasses

OTHER PROTECTIVE EQUIPMENT:

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Store away from open flame and extreme heat.

OTHER PRECAUTIONS:

Form Approved
Budget Bureau No. 44-R1387
Approval Expires April 30, 1971

Form No. LSB-OOS-4
May 1969

U.S. DEPARTMENT OF LABOR

WAGE AND LABOR STANDARDS ADMINISTRATION
Bureau of Labor Standards

13

MATERIAL SAFETY DATA SHEET

Mogul HP-25

SECTION I

MANUFACTURER'S NAME: The Mogul Corporation	EMERGENCY TELEPHONE NO.: (216) 247-5000
ADDRESS (Number, Street, City, State, and ZIP Code): Chagrin Falls, Ohio 44022	
CHEMICAL NAME AND SYNONYMS: None: Proprietary Boiler Water Treatment	TRADE NAME AND SYNONYMS: MOGUL HP-280
CHEMICAL FAMILY: Strong Alkali	FORMULA: Proprietary Composition

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
None.		
MOGUL HP-280 is acceptable for use in the treatment of boilers producing		
steam that will contact food, in accordance with the terms of the Code		
of Federal Regulations, 21 CFR 121.1088, "Boiler Water Additives."		

SECTION III PHYSICAL DATA

BOILING POINT (°F.) Approximate	225° F	SPECIFIC GRAVITY (H_2O=1)	1.30
VAPOR PRESSURE (mm Hg.)		PERCENT VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (Water =1)	1
SOLUBILITY IN WATER	Complete		
APPEARANCE AND ODOR: Straw colored liquid.			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): Not Applicable	FLAMMABLE LIMITS: Not Applicable	Lel	Uel
EXTINGUISHING MEDIA: Not Applicable			
SPECIAL FIRE FIGHTING PROCEDURES: Not Applicable			
UNUSUAL FIRE AND EXPLOSION HAZARDS: Not Applicable			

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: Liquid, not established / applicable.

EFFECTS OF OVEREXPOSURE: Alkaline liquid: May be irritating or burn skin.

Eyes: Irritating, may cause damage. Ingestion: May burn.

EMERGENCY AND FIRST AID PROCEDURES: Skin or eye contact: Flood contaminated area with water. Remove contaminated clothing. Internal: Do not induce vomiting, give vinegar (1:4), follow with milk. Consult physician for eye contact, ingestion or if irritation persists.

SECTION VI REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*: Aluminum, leather, wool, tin, zinc and alloys containing those metals.

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Wipe up and flush with water. If spill is excessive, dilute, neutralize and flush.

WASTE DISPOSAL METHOD: Dilute with water and discharge if regulations permit, or contact scavenger. pH adjustment may be required; if so, should be accomplished in the open or very well ventilated area.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*: Usually not required.

VENTILATION		
	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES: Rubber

EYE PROTECTION: Chemical safety goggles or glasses.

OTHER PROTECTIVE EQUIPMENT: Usually not required - rubber apron desirable if splashing is likely.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Avoid contact with eyes and prolonged contact with skin. Do not take internally. Protect from freezing and extreme heat.

OTHER PRECAUTIONS: Avoid contact with incompatible materials.

A General Purpose Formulated
Boiler Water Treatment

MOGUL® HP-280

PRODUCT BULLETIN

APPLICATION

MOGUL HP-280 is a general purpose formula for use in boilers operating up to 300 lbs./sq. inch, where a single formula boiler water conditioner is desired. It is especially well suited where hard water makeup is used, in low pressure steam heating systems or in industrial steam systems where a moderater to major part of the condensate is returned to the boiler.

MOGUL HP-280 combines in a single formulation alkalinity and hardness control, plus extremely powerful sludge conditioning through the incorporation of a synthetic polymer. MOGUL HP-280 also contains a special conditioner to handle iron corrosion products which may enter the boiler from condensate return in the feedwater.

PRODUCT PROPERTIES

Physical state	- Straw-colored liquid
Density	- 11.1 lbs./gal.
pH 1% solution	- 12.2
Solubility	- Complete in water

DOSAGE

Dosages of MOGUL HP-280 depend upon hardness in the boiler feedwater.

FEEDING

MOGUL HP-280 may be fed to the boiler on a one shot or a gradual and continuous basis depending upon the individual operation. Heating systems receiving 95% or more condensate return may normally be fed on a one shot basis. Where appreciable amounts of hardness enter the boiler in the feedwater, gradual and continuous feeding is recommended.

USAGE INFORMATION

MOGUL HP-280 is acceptable for use in the treatment of boilers producing steam that will contact food, in accordance with the terms of the Code of Federal Regulations, 21 CFR 121.1088, "Boiler Water Additives."

HANDLING & SAFETY

Alkaline liquid - Avoid contact with acids, zinc, aluminum and organic materials. Protect from freezing and extreme heat. Keep container closed when not in use.

Will irritate eyes, skin and mucous membranes. Do not take internally. Avoid contact with eyes and skin. Wear appropriate personal protective equipment to enable safe handling of an alkaline liquid. Refer to Material Safety Data Sheet for further information.

TESTING & CONTROL

Treatment levels of MOGUL HP-280 are normally controlled by means of alkalinity tests on the boiler water. In most cases, it will be desirable to hold P alkalinity between 300 and 600 ppm, or a total alkalinity between 400 and 700 ppm.

PACKAGING & SHIPPING

Shipped in non-returnable drums.

FOB Shipping Point.

NOTICE:

IMPORTANT. Read and follow directions supplied by The Mogul Corporation or its authorized agent carefully. This product is not intended for consumer use. It is intended for industrial use only. The Mogul Corporation warrants that this material is reasonably fit for the purposes stated in our literature when used in accordance with our directions. The buyer assumes all risk and liability for use of this material when not in strict accordance with our directions. Neither this warranty nor any other warranty of "Merchantability" or "Fitness For A Particular Purpose," express or implied, extends to the use of this material contrary to our directions, or under abnormal conditions, or under conditions not reasonably forseeable by The Mogul Corporation. IF THE PURCHASER DOES NOT ACCEPT THE GOODS ON THESE TERMS, THEY ARE TO BE RETURNED AT ONCE, UNOPENED.

THE MOGUL CORPORATION
EXECUTIVE OFFICES — CHAGRIN FALLS, OHIO 44022

PB-280
Printed in the U.S.A.

Form Approved
Budget Bureau No. 44-R1387
Approval Expires April 30, 1971

Form No. LSB-OOS-4
May 1969

U.S. DEPARTMENT OF LABOR

WAGE AND LABOR STANDARDS ADMINISTRATION
Bureau of Labor Standards

MATERIAL SAFETY DATA SHEET

11
Mogul WS-128

SECTION I

MANUFACTURER'S NAME: The Mogul Corporation	EMERGENCY TELEPHONE NO.: (216) 247-5000
ADDRESS (Number, Street, City, State, and ZIP Code): Chagrin Falls, Ohio 44022	
CHEMICAL NAME AND SYNONYMS: None: Proprietary Brine Treatment	TRADE NAME AND SYNONYMS: MOGUL WS-128, Mogul Brine Treatment
CHEMICAL FAMILY: Strong Alkali	FORMULA: Proprietary Composition

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.) Approximate	240° F	SPECIFIC GRAVITY (H_2O=1)	1.28
VAPOR PRESSURE (mm Hg.)		PERCENT VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (Water =1) Approximate	1
SOLUBILITY IN WATER	Complete		
APPEARANCE AND ODOR: Dark yellow liquid			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): Not Applicable	FLAMMABLE LIMITS: Not Applicable	Lel	Uel
EXTINGUISHING MEDIA: Not Applicable			
SPECIAL FIRE FIGHTING PROCEDURES: Not Applicable			
UNUSUAL FIRE AND EXPLOSION HAZARDS: Not Applicable			

OSHA WS-128

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	Liquid, not established.
EFFECTS OF OVEREXPOSURE	May cause irritation to skin or eyes; DO NOT take internally - POISON.
EMERGENCY AND FIRST AID PROCEDURES	Skin or eye contact: Flood contaminated area with water. Remove contaminated clothing. Internal: Give 2-4 glasses warm water immediately. Induce vomiting immediately. Repeat until vomitus is clear. Give Universal Antidote. Consult physician for eye contact, ingestion or if irritation persists.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)* Strong acids and reducing materials.

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Wipe up and flush with water. If spill is excessive, dilute, neutralize and flush.

WASTE DISPOSAL METHOD
Dilute with water and discharge if regulations permit, or contact scavenger. pH adjustment may be required; if so, should be accomplished in the open or very well ventilated area.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)* Usually not required.

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES Rubber	EYE PROTECTION Chemical safety goggles or glasses.

OTHER PROTECTIVE EQUIPMENT
Usually not required - rubber apron desirable if splashing is likely.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid contact with eyes and prolonged contact with skin. Do not take internally. Protect from freezing and extreme heat.

OTHER PRECAUTIONS
Avoid incompatible materials.

Mortars - Wet #1

MATERIAL SAFETY DATA SHEET

J.H. FRANCE REFRACTORIES CO.

SNOW SHOE, PA 16874

TELEPHONE 814-387-6811

Date Prepared:
Nov. 19, 1985

Date Revised:

General Classification of Product: MORTARS — WET & DRY

Trade Name/Synonym of Product:

DRY	WET
FRANCE AIR SET	FRANSET AIR SET
FRANCITE HEAT SET	FRANSET AIR SET, SUPER BOND
FRANSIL AIR SET	FRANSIL AIR SET
FRANSIL HEAT SET	SPARTAN AIR SET
SPARTAN AIR SET	THERMASTIC AIR SET
THERMASTIC AIR SET	*SPARTAN CAP, AIR SET
MILITARY, AIR SET	TE-16
TE-16	FRANSET FS/7
ANDALU, AIR SET	ANDALU, AIR SET

Hazardous Ingredients — Section I

Ingredient	CAS Number
Aluminum Sulphate	10043-01-3
Silicate of Soda	1344-09-8
Phosphoric Acid	7664-38-2
*Chromium Oxide	1308-38-9
Chrystalline Silica	7631-86-9
Hexameta Phosphate	10124-56-8

Physical Data — Section II

Appearance & Color

Powder or paste — Tan, gray, green

Odor & Solubility

Slight odor (acid) insoluble in water and all acids except HF

Fire & Explosion Data — Section III

This material is noncombustible. Use extinguishing media appropriate to surrounding area.

Health Hazard Data — Section IV

Inhalation of all dusts are hazardous. Crystalline silica when inhaled may cause silicosis. This is a chronic slowly developing lung disease. Alum Sulphate, silicate of soda, hexameta phosphate may cause skin and eye irritations. Chromium oxide may revert to hexavalent chrome during firing with other materials (for example, Li, Na, K, Ca, Mg, etc.). Certain water insoluble chromium compounds are carcinogen. Used product should be disposed of as hazardous waste if hexalent chromium compounds are detectable.

Reactivity — Section V

This material is stable under ordinary conditions.

Emergency and First Aid Procedures — Section VI

Terminate exposure. If affected, consult a physician. Flush eyes and skin with water.

Spill, Leak, and Disposal — Section VII

Avoid inhalation of dusts. Protect eyes and skin. Consult with proper state, local, and federal authorities on waste removal regulations.

Special Protection Information — Section VIII

Wear NIOSH approved safety masks, eye glasses, and gloves. Ventilate where necessary.

Special Precautions and Comments — Section IX

Products having a C/A notation contain Trivalent Chrome in their sold form.

Prepared By: I. Dulberg

Title: Technical Manager

Form Approved
Budget Bureau No. 44-R1387
Approval Expires April 30, 1971

Form No. LSB-OOSHS
May 1969

U.S. DEPARTMENT OF LABOR

WAGE AND LABOR STANDARDS ADMINISTRATION
Bureau of Labor Standards

MATERIAL SAFETY DATA SHEET

MURIATIC ACID / Hydrochloric Acid (39)

December 1971

SECTION I

MANUFACTURER'S NAME: Monsanto Company	EMERGENCY TELEPHONE NO.: (314) 694-1000
ADDRESS (Number, Street, City, State, and ZIP Code): 800 North Lindbergh Blvd., St. Louis, Missouri 63166	
CHEMICAL NAME AND SYNONYMS: Hydrochloric Acid	TRADE NAME AND SYNONYMS: Muriatic Acid
CHEMICAL FAMILY: Chlorine	FORMULA: HCl

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	(1)	SPECIFIC GRAVITY (H_2O=1)	(1)
VAPOR PRESSURE (mm Hg.)	(1)	PERCENT VOLATILE BY VOLUME (%)	NA
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____=1)	
SOLUBILITY IN WATER	Complete		
APPEARANCE AND ODOR	Clear, colorless to slightly yellow liquid. Sharp, pungent irritating odor.		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel

EXTINGUISHING MEDIA

SPECIAL FIRE FIGHTING PROCEDURES

UNUSUAL FIRE AND EXPLOSION HAZARDS
Nonflammable, but reacts with most metals with evolution of hydrogen which may cause fire or explosion with air.

(1) See Chemical Safety Data Sheet SD-39 - Manufacturing Chemists' Assn.

cc B. Groves
7-1-81

C01388

SECTION V HEALTH HAZA

THRESHOLD LIMIT VALUE: Hydrogen chloride

EFFECTS OF OVEREXPOSURE: Causes severe burns, permanent visual damage may occur.

EMERGENCY AND FIRST AID PROCEDURES: In case of contact immediately flush skin and eyes with plenty of water for at least 15 minutes; for eyes get medical attention.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Flush with copious quantities of water. Use soda ash or lime to neutralize acid.

WASTE DISPOSAL METHOD: Flush with water. Landfill dry neutralized residue

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES: Yes

EYE PROTECTION: Goggles

OTHER PROTECTIVE EQUIPMENT: See Chemical Safety Data Sheet SD-39. Manufacturing Chemists' Assn.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: See SD-39. Store containers out of direct rays of sun and away from sources of heat.

OTHER PRECAUTIONS

Form Approved
Budget Bureau No. 44-R1387
Approval Expires April 30, 1971

Form No. LSB-OOS-
May 19

U.S. DEPARTMENT OF LABOR

WAGE AND LABOR STANDARDS ADMINISTRATION
Bureau of Labor Standards

5.1-- X

MATERIAL SAFETY DATA SHEET

May 19

SECTION I

MANUFACTURER'S NAME: Nalco Chemical Company	EMERGENCY TELEPHONE NO.: ~~312-272-3030~~
ADDRESS (Number, Street, City, State, and ZIP Code): 6216 West 66 Place, Chicago, Illinois 60638	
CHEMICAL NAME AND SYNONYMS: Catalyzed Sodium Sulfite	TRADE NAME AND SYNONYMS: Nalco 19 Ball
CHEMICAL FAMILY: ----------	FORMULA: ----------

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE N/A			METALLIC COATINGS N/A		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
N/A		

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	-------	SPECIFIC GRAVITY (H_2O=1)	-------
VAPOR PRESSURE (mm Hg.)	-------	PERCENT VOLATILE BY VOLUME (%)	-------
VAPOR DENSITY (AIR=1)	-------	EVAPORATION RATE (_____ =1)	-------
SOLUBILITY IN WATER			

APPEARANCE AND ODOR: Slight tan or grey, sweet smelling ball briquette

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): None	FLAMMABLE LIMITS	Lel	Uel

EXTINGUISHING MEDIA: N/A

SPECIAL FIRE FIGHTING PROCEDURES: None

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

C01389

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	None established-use nuisance dust value 10 mg/M^3
EFFECTS OF OVEREXPOSURE	Can cause skin and eye irritation
EMERGENCY AND FIRST AID PROCEDURES	Skin: Wash with plenty of water
	Eyes: Wash with water for 15 minutes-call a physician
	If swallowed: Induce vomiting-call a physician

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATABILITY *(Materials to avoid)*	None		
HAZARDOUS DECOMPOSITION PRODUCTS	Oxides of sulfur		
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Vacuum or sweep up spills

WASTE DISPOSAL METHOD

No special method required

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)* ----------

VENTILATION	LOCAL EXHAUST ----------	SPECIAL	----------
	MECHANICAL *(General)* ----------	OTHER	----------
PROTECTIVE GLOVES	Rubber	EYE PROTECTION	Safety glasses

OTHER PROTECTIVE EQUIPMENT None

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid prolonged skin contact. Avoid breathing dust.

OTHER PRECAUTIONS

None

Form Approved
Budget Bureau No. 44-R1307
Approval Expires April 30, 1971

Form No. LSB-OOS-4
May 1969

U.S. DEPARTMENT OF LABOR

WAGE AND LABOR STANDARDS ADMINISTRATION
Bureau of Labor Standards

Sec. Ion X

MATERIAL SAFETY DATA SHEET

Nalco 749

SECTION I

MANUFACTURER'S NAME: Nalco Chemical Company	EMERGENCY TELEPHONE NO.: 312-272-3030
ADDRESS (Number, Street, City, State, and ZIP Code): 6216 West 66 Place, Chicago, Illinois 60638	
CHEMICAL NAME AND SYNONYMS: Phosphate-sulfite blend	TRADE NAME AND SYNONYMS: Nalco 749 Ball
CHEMICAL FAMILY: Inorganic salts	FORMULA: Proprietary

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE N/A			METALLIC COATINGS N/A		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
None		

SECTION III PHYSICAL DATA

BOILING POINT (°F.)		SPECIFIC GRAVITY (H_2O=1)	
VAPOR PRESSURE (mm Hg.)		PERCENT VOLATILE BY VOLUME (%)	
VAPOR DENSITY (AIR=1)		EVAPORATION RATE (_____=1)	
SOLUBILITY IN WATER	Soluble		
APPEARANCE AND ODOR	Black ball briquette with a slight sweet odor		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel

EXTINGUISHING MEDIA

SPECIAL FIRE FIGHTING PROCEDURES
None

UNUSUAL FIRE AND EXPLOSION HAZARDS
None

C01390

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: "Nuisance Dust" - 10 mg/M^3

EFFECTS OF OVEREXPOSURE: May cause temporary irritation to skin, eyes or respiratory tract (if inhaled dust)

EMERGENCY AND FIRST AID PROCEDURES

Skin: Wash with plenty of water

Eyes: Wash with water for 15 minutes - call a physician

If swallowed: Do not induce vomiting - call a physician

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*: None

HAZARDOUS DECOMPOSITION PRODUCTS: May form oxides of sulfur upon decomposition

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Sweep up dust

WASTE DISPOSAL METHOD: Dispose of by complete curial or complete combustion

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES: Rubber

EYE PROTECTION: Safety glasses

OTHER PROTECTIVE EQUIPMENT: None

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: None

OTHER PRECAUTIONS: None

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SIGNED _____

DATED _____

Budget Bureau No. 44-R1387
Approval Expires April 30, 1971

U.S. DEPARTMENT OF LABOR

WAGE AND LABOR STANDARDS ADMINISTRATION
Bureau of Labor Standards

Coating Color — Nalco 310

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME: Nalco Chemical Company	EMERGENCY TELEPHONE NO.: ~~312-272-3030~~
ADDRESS (Number, Street, City, State, and ZIP Code): 6216 West 66 Place, Chicago, Illinois 60638	
CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS: Nalco 310
CHEMICAL FAMILY: Liquid organic-inorganic blend	FORMULA: ~~Proprietary~~

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE N/A			METALLIC COATINGS N/A		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
N/A		

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	-----	SPECIFIC GRAVITY (H_2O=1) @60°F	1.311
VAPOR PRESSURE (mm Hg.)	-----	PERCENT VOLATILE BY VOLUME (%)	------
VAPOR DENSITY (AIR=1)	-----	EVAPORATION RATE (_____=1)	------
SOLUBILITY IN WATER	soluble	pH	5.9
APPEARANCE AND ODOR	liquid with slight ammonia odor		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
none			
EXTINGUISHING MEDIA			
SPECIAL FIRE FIGHTING PROCEDURES: None			
UNUSUAL FIRE AND EXPLOSION HAZARDS: None			

C01391

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE	None
EFFECTS OF OVEREXPOSURE	may be irritating to eyes and skin
EMERGENCY AND FIRST AID PROCEDURES	Skin: Wash with plenty of water
	Eyes: Wash with water for 15 minutes - call a physician
	If swallowed: Induce vomiting - call a physician

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	
INCOMPATABILITY *(Materials to avoid)*	None		
HAZARDOUS DECOMPOSITION PRODUCTS	None		
HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Wash down with water
WASTE DISPOSAL METHOD
No special method

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*	None	
VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER
PROTECTIVE GLOVES	Rubber	EYE PROTECTION: goggles
OTHER PROTECTIVE EQUIPMENT	None	

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid contact with skin and eyes. Do not take internally
OTHER PRECAUTIONS: None

Form Approved
Budget Bureau No. 44-R1387
Approval Expires April 30, 1971

Form No. LSB-OOS-
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U.S. DEPARTMENT OF LABOR

WAGE AND LABOR STANDARDS ADMINISTRATION

Bureau of Labor Standards

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME: Nalco Chemical Company	EMERGENCY TELEPHONE NO.: 312-272-3030
ADDRESS (Number, Street, City, State, and ZIP Code): 6216 West 66 Place, Chicago, Illinois 60638	
CHEMICAL NAME AND SYNONYMS: Boiler Feedwater Treatment	TRADE NAME AND SYNONYMS: NALPAC 8241
CHEMICAL FAMILY	FORMULA: ------

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE N/A			METALLIC COATINGS N/A		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
Hexamethylenediamine	5	--

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	---	SPECIFIC GRAVITY (H_2O=1) 60°F	1.068
VAPOR PRESSURE (mm Hg.)	---	PERCENT VOLATILE BY VOLUME (%)	---
VAPOR DENSITY (AIR=1)	---	EVAPORATION RATE (_____=1)	---
SOLUBILITY IN WATER	Soluble	pH as drummed	13.6
APPEARANCE AND ODOR	Light brown liquid with slightly ammonia odor		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
None			

EXTINGUISHING MEDIA: N/A

SPECIAL FIRE FIGHTING PROCEDURES: None

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

C01392

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: None for product . Recommended HMDA - 10 ppm

EFFECTS OF OVEREXPOSURE: Can cause caustic burns to skin or eyes. May cause gastric disturbances if swallowed(as drummed). HMDA may cause allergic response in susceptible individuals.

EMERGENCY AND FIRST AID PROCEDURES:
Eye: Wash with water for at least 15 min. Call a physician
Skin: Wash with plenty of water
If swallowed: Give water. Do not induce vomiting. Call a physician

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*: None

HAZARDOUS DECOMPOSITION PRODUCTS: None

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Wash down with water

WASTE DISPOSAL METHOD

No special method

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*: None

VENTILATION	LOCAL EXHAUST	-----	SPECIAL	-----
	MECHANICAL *(General)*	-----	OTHER	-----

PROTECTIVE GLOVES: Rubber

EYE PROTECTION: Goggles

OTHER PROTECTIVE EQUIPMENT: None

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:
Avoid contact with skin and eyes.
Do not take internally

OTHER PRECAUTIONS: None

Neu-Tri (R) Solvent

MATERIAL SAFETY DATA SHEET

Dow Chemical U.S.A. Midland, MI 48674 Emergency Phone: 517-636-4400

MSD: 000168 Page: 1

PRODUCT NAME: NEU-TRI (R) SOLVENT

Effective Date: 10/05/85 Date Printed: 10/07/85 Product Code: 56530

1. INGREDIENTS:

Trichloroethylene	CAS# 000079-01-6	99.4%
1, 2-Butylene oxide	CAS# 000106-88-7	

2. PHYSICAL DATA:

BOILING POINT: 189F (87C)
VAP PRESS: 60 mmHg @ 20C
VAP DENSITY: 4.53
SOL. IN WATER: 0.1 g/100g @ 25C
SP. GRAVITY: 1.46 @ 25/25C
APPEARANCE: Colorless liquid.
ODOR: Not available.

3 FIRE AND EXPLOSION HAZARD DATA:

FLASH POINT: None
METHOD USED: TCC

FLAMMABLE LIMITS
LFL: 8.0% 25C
UFL: 10.5% 25C

EXTINGUISHING MEDIA: Water fog.

FIRE & EXPLOSION HAZARDS: Strong unpleasant odor. Autoignition temperature is 788F, 420C.

FIRE-FIGHTING EQUIPMENT: Wear a positive pressure self-contained breathing apparatus.

4. REACTIVITY DATA:

STABILITY: (CONDITIONS TO AVOID) Avoid open flames, welding arcs, or other high temperature sources which induce thermal decomposition to irritating and corrosive HCl from solvent vapor. Strong UV light (eg. welding arc) can cause significant phosgene to be generated.

ontinued on Page 2)

4. REACTIVITY DATA: (Continued)

INCOMPATIBILITY: (SPECIFIC MATERIALS TO AVOID) Strong bases: caustic soda, caustic potash. Metallic aluminum and zinc powders should be avoided.

HAZARDOUS DECOMPOSITION PRODUCTS: Involvement in fire or high temperatures forms hydrogen chloride and very small amounts of phosgene & chlorine. Solvent decomposition occurs when catalyzed by metal chlorides which can be produced by reaction of HCl and metals in the system. In the presence of aluminum and excessive water the decomposition can proceed rapidly with production of large amounts of heat and HCl fumes. Contamination of solvent with small amounts of 1,1,1-trichloroethane can affect stabilizers and shorten solvent life.

HAZARDOUS POLYMERIZATION: Will not occur.

5. ENVIRONMENTAL AND DISPOSAL INFORMATION:

ACTION TO TAKE FOR SPILLS/LEAKS: Small spills: Mop up, wipe up or soak up immediately. Remove to out of doors. Large spills: Evacuate area. Contain liquid; transfer to closed metal containers. Keep out of water supply.

DISPOSAL METHOD: When disposing of the unused contents, the preferred options are to send to licensed reclaimer, or to permitted incinerators, in compliance with local, state, and federal regulations including Subtitle C of The Resource Conservation and Recovery Act. Dumping into sewers, on the ground, or into any body of water is strongly discouraged, and may be illegal. Consult The Dow Chemical Company for further information.

(ntinued on Page 3)

6. HEALTH HAZARD DATA:

EYE: May cause pain and slight eye irritation. Corneal injury is unlikely. In animals irritation healed primarily within 7 days.

SKIN CONTACT: Prolonged or repeated exposure may cause skin irritation. May cause drying or flaking of skin. May cause more severe response if confined to skin.

SKIN ABSORPTION: A single prolonged exposure is not likely to result in the material being absorbed through skin in harmful amounts. The LD50 for skin absorption in rabbits is approx. 10,000 mg/kg. Trichloroethylene may be absorbed through skin to some degree increasing blood concentrations or causing numbness of fingers when they are immersed in it.

INGESTION: Single dose oral toxicity is low. The oral LD50 for rats is 4920 mg/kg. If aspirated (liquid enters the lung), may be rapidly absorbed through the lungs and result in injury to other body systems.

INHALATION: Excessive exposure may cause irritation to upper respiratory tract and may increase sensitivity to epinephrine and increase myocardial irritability (irregular heartbeats). Minimal anesthetic or irritant effects may be seen around 200-400 ppm; progressively higher levels may cause dizziness, drunkenness, concentrations as low as 1000-2000 ppm, unconsciousness, and death. Extremely high vapor concentrations (over 6000 ppm) are immediately hazardous to life. In confined or poorly ventilated areas, vapors can readily accumulate and can cause unconsciousness and death. The LC50 for rats is 12,500 ppm for 4 hours.

SYSTEMIC & OTHER EFFECTS: Alcohol consumed before or after exposure may increase adverse effects. Excessive exposure may cause temporary vasodilation of the skin called "degreaser's flush." Excessive exposure to high concentrations may cause liver or kidney effects while lower concentrations well above accepted guidelines may cause central or possibly even peripheral nervous system effects. Trichloroethylene has been shown to increase the rate of spontaneously occurring malignant tumors in one strain of laboratory mouse given large doses.

(Continued on Page 4)

8. HANDLING PRECAUTIONS:

EXPOSURE GUIDELINE(S): The ACGIH TLV is 50 ppm and STEL is 200 200 ppm; OSHA PEL is 100 ppm, ACC is 200 ppm, MAC is 300 ppm for trichloroethylene.

The Dow Industrial Hygiene Guide for 1,2-butylene oxide is 40 ppm with an excursion guide of 100 ppm.

VENTILATION: Control airborne concentrations below the exposure guideline. Use only with adequate ventilation. Local exhaust ventilation may be necessary for some operations. Lethal concentrations may exist in areas with poor ventilation.

RESPIRATORY PROTECTION: Atmospheric levels should be maintained below the exposure guideline. When respiratory protection is required for certain operations, use an approved air-purifying respirator. For emergency and other conditions where the exposure guideline may be greatly exceeded, use an approved positive-pressure self-contained breathing apparatus. In confined or poorly ventilated areas, use an approved positive-pressure self-contained breathing apparatus.

SKIN PROTECTION: For brief contact, no precautions other than clean body-covering clothing should be needed. When prolonged or frequently repeated contact could occur, use protective clothing impervious to this material. Selection of specific items such as gloves, boots, apron, or full body suit will depend on operation.

EYE PROTECTION: Use safety glasses. Where contact with liquid is likely, chemical goggles are recommended because eye contact with this material may cause pain, even though it is unlikely to cause injury.

9. ADDITIONAL INFORMATION:

SPECIAL PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE: Handle with reasonable care. Avoid breathing vapors. Store in cool place. Concentrated vapors of this product are heavier than air and will collect in low areas such as pits, degreasers, storage

(Continued on Page 6)

6. HEALTH HAZARD DATA: (Continued)

Data suggest a non-mutagenic mechanism for tumor formation implying that non-toxic doses of trichloroethylene should pose little or no carcinogenic hazard for man. Birth defects are unlikely. Exposures having no effect on the mother should have no effect on the fetus. Did not cause birth defects in animals; other effects were seen in the fetus only at doses which caused toxic effects to the mother. Results of in vitro ("test tube") mutagenicity tests have been inconclusive. Results of mutagenicity tests in animals have been inconclusive. Pure trichloroethylene lacks mutagenic potential in most tests.

7. FIRST AID:

EYES: Irrigate immediately with water for at least 5 minutes.

SKIN: Wash off in flowing water or shower. Remove contaminated clothing and air thoroughly before reuse.

INGESTION: Do not induce vomiting. Call a physician and/or transport to emergency facility immediately.

INHALATION: Remove to fresh air. If not breathing, give mouth-to-mouth resuscitation. If breathing is difficult, give oxygen. Call a physician.

NOTE TO PHYSICIAN: Because rapid absorption may occur through lungs if aspirated and cause systemic effects, the decision of whether to induce vomiting or not should be made by a physician. If lavage is performed, suggest endotracheal and/or esophageal control. Danger from lung aspiration must be weighed against toxicity when considering emptying the stomach. Exposure may increase "myocardial irritability". Do not administer sympathomimetic drugs unless absolutely necessary. No specific antidote. Supportive care. Treatment based on judgment of the physician in response to reactions of the patient.

(ntinued on Page 5)

9. ADDITIONAL INFORMATION: (Continued)

tanks and other confined areas. Do not enter these areas where vapors of this product are suspected unless special breathing apparatus is used and an observer is present for assistance.

MSDS STATUS: Revised 1, 3, 4, 5, 6, 7, 8, and 9.

Plastics, High Alumina Plasters

MATERIAL SAFETY DATA SHEET

J.H. FRANCE REFRACTORIES CO.

SNOW SHOE, PA 16874

TELEPHONE 814-387-6811

Date Prepared:
Nov. 19, 1985

Date Revised:

General Classification of Product: PLASTICS, HIGH ALUMINA PLASTERS

Trade Name/Synonym of Product:

SPARTAN 80AS
*SPARTAN 85P
*SPARTAN 90P
ANDALU
**SPARTAN CA-P
*SPARTAN 55P
SPARTAN G (Graphitic)
*SPARTAN 55P — PLASTER
*SPARTAN 85P — PLASTER
*SPARTAN 90P — PLASTER
PHA 988 PLASTER

Hazardous Ingredients — Section I

Ingredient	CAS Number
Crystalline Silica	7631-86-9
*Phosphoric Acid	7664-38-2
**Chrome Oxide	1310-73-2
Alum Sulphate	1344-28-1
Graphite	7782-42-5

Physical Data — Section II

Appearance & Color

White to Black — moldable mass

Odor & Solubility

Acid odor
Insoluble in water, soluble in HF

Fire & Explosion Data — Section III

This material is noncombustible. Use extinguishing media appropriate to surrounding area.

Health Hazard Data — Section IV

Inhalation of all dusts are hazardous. Crystalline silica when inhaled may cause silicosis. This is a chronic slowly developing disease. Phosphoric acid may cause skin and eye burns Chromium oxide may revert to the hexavalent form of chrome during firing with other materials (for example, Li, Na, K, Ca, Mg, etc.). Certain water insoluble chromium compounds are carcinogen. Used product should be disposed of as hazardous waste if hexavalent chromium compounds are detectable.

Reactivity **Section V**

This material is stable under ordinary conditions.

Emergency and First Aid Procedures **Section VI**

Terminate exposure. If affected, consult physician. Flush eyes and skin with water.

Spill, Leak, and Disposal **Section VII**

Avoid inhalation of dusts. Protect eyes and skin. Consult with local, state, and federal authorities on waste removal.

Special Protection Information **Section VIII**

Wear NIOSH approved safety masks, eye glasses, and gloves. Ventilate where necessary.

Special Precautions and Comments **Section IX**

None

Prepared By: I. Dulberg

Title: Technical Manager

Plastics, Fireclay and Bauxite Base

MATERIAL SAFETY DATA SHEET

J.H. FRANCE REFRACTORIES CO.

SNOW SHOE, PA 16874

TELEPHONE 814-387-6811

Date Prepared:
Nov. 19, 1985

Date Revised:

General Classification of Product: PLASTICS, FIRECLAY AND BAUXITE BASE

Trade Name/Synonym of Product:

FRANCO SUPER AS	SUPER SILEX GRAPHITIC
FRANCO SUPER HS	
FRANCO 60 AS	
FRANCO 60 HS	
FRANCITE 70 AS	
FRANCITE 70 HS	
FRANCO REG AS	
FRANCO REG HS	

Hazardous Ingredients — Section I

Ingredient	CAS Number
Crystalline Silica	7631-86-9
Alum Sulphate	1344-28-1
Graphite	7782-42-5

Physical Data — Section II

Appearance & Color

Tan to Black, moldable mass

Odor & Solubility

Odor slight, insoluble in water, soluble in HF

Fire & Explosion Data — Section III

This material is noncombustible. Use extinguishing media appropriate to surrounding area.

Health Hazard Data — Section IV

Inhalation of all dusts are hazardous. Crystalline silica when inhaled may cause silicosis. This is a chronic slowly developing lung disease. Alum Sulphate binder may cause eye and skin burns.

Reactivity — Section V

This material is stable under ordinary conditions.

Emergency and First Aid Procedures — Section VI

Terminate exposure. If affected, consult a physician. Flush eyes and skin with water.

Spill, Leak, and Disposal — Section VII

Avoid inhalation of dusts. Protect eyes and skin. Consult with local, state, and federal authorities on waste removal regulations.

Special Protection Information — Section VIII

Wear NIOSH approved safety masks, eye glasses, and gloves. Ventilate where necessary.

Special Precautions and Comments — Section IX

None

Prepared By: I. Dulberg

Title: Technical Manager

Polyphosphate - Dichromate Solution

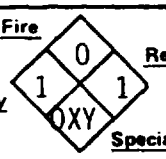
MOGUL
DIVISION OF THE DEXTER CORPORATION
Executive Offices
Chagrin Falls, Ohio 44022
(216) 247-5000

For sales offices or product literature, Call Toll Free: 800-321-1004
FOR MEDICAL EMERGENCY, CALL COLLECT (216) 835-7233

MATERIAL SAFETY DATA SHEET

IN FIRE CONDITIONS:
NATIONAL FIRE PROTECTION ASSOCIATION
(NFPA)

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT
* = CHRONIC
HEALTH HAZARD - SEE SECTION V



SECTION I: PRODUCTION IDENTIFICATION

016

TRADE NAME: WS-123
CHEMICAL NAME: Polyphosphate - Dichromate Solution
CHEMICAL FAMILY: Industrial Water Treatment

SECTION II: HAZARDOUS INGREDIENTS

Material	CAS #	%	TLV	PEL
Sodium dichromate dihydrate	10588-01-9	20-30	0.05 mg/m^3	0.1 mg/m^3

SECTION III: PHYSICAL DATA

Boiling Point (F):	Like water	Specific Gravity:	1.24
Vapor Pressure (mm Hg):	Like water	Percent Volatile by Volume(%):	Approx.70
Vapor Density (air = 1):	Like water	Evap. Rate (water =1):	Like water
Solubility in Water:	Complete	pH:	5.2
Density:	Not applicable (N/A)	pH (1% soln):	--

Appearance and Odor: Orange liquid, mild odor

SECTION IV: FIRE PROTECTION INFORMATION

Flash Point (method used): NA
Flammable Limits: NA
Extinguishing Media: Water, CO_2, dry chemical, foam

Special Fire-Fighting Procedures: Keep drums, exposed to fire, cool with water.

Unusual Fire and Explosion Hazards: Contains dichromate, an oxidizer. In fire, if water is driven off, product may ignite or explode in presence of combustible materials.

National Fire Protection Association (NFPA) Rating (in fire conditions):
Toxicity: 1 Fire: 0 Reactivity: 1 Special: OXY

C01396

SECTION V: HEALTH HAZARD INFORMATION

PRIMARY ROUTE(s) OF ENTRY	X	SKIN CONTACT	X	INHALATION ( )		INGESTION
	X	EYE CONTACT	X	SKIN ABSORPTION		

Acute effects of exposure:

TOXIC ACIDIC MATERIAL!

Causes eye damage or irritation. Chromate can be absorbed through skin; massive overexposure to skin may result in kidney failure and death.

Inhalation of mists may cause severe irritation of the respiratory tract and nasal septum and possible perforation. Ingestion can cause severe tissue destruction; kidney failure and death.

Chronic effects of exposure:

Prolonged or repeated eye contact may cause conjunctivitis. Prolonged or repeated skin contact, especially with broken skin, may cause "chrome sores". Ulceration and perforation of the nasal septum may result from prolonged or repeated inhalation of sodium bichromatic mists and dusts.

NTP - Known to be carcinogenic, 1981
IARC - Sufficient evidence for carcinogenicity, 1982

There is laboratory evidence that Aqueous Sodium Bichromate administered directly into the lung, at the highest tolerated dose, over the lifetime of rats, causes a significant increased incidence of lung cancer.

Emergency and First Aid Procedures:

Skin: Flush with water, then wash thoroughly with soap and water.

Eyes: Flush with water for 15 minutes and get medical attention if an irritation persists.

Ingestion: Drink plenty of water, and call collect (216) 835-7233 or consult physician immediately. Avoid alcoholic beverages.

FOR 24 HOUR EMERGENCY MEDICAL INFORMATION CALL COLLECT (216) 835-7233 (TEL-SAFE).

For additional non-emergency information:

Director of Safety
Mogul Division
Chagrin Falls, OH 44022
(216) 247-5000

SECTION VI: REACTIVITY DATA

Stable: Yes

Hazardous Polymerization: No

Conditions to Avoid:

None known

Materials to Avoid:

Organic, combustible or oxidizable materials; strong acids.

Hazardous Decomposition Products:

Nitrogen oxides, carbon monoxide, carbon dioxide and/or hydrogen cyanide possible upon thermal decomposition.

SECTION VII: SPILL OR LEAK PROCEDURES AND WASTE DISPOSAL

Spill or Leak Procedures:

Contain spill if without risk. Use inert absorbent material such as sand or clay to soak up and place in empty drums. Do not use sawdust or other combustible absorbent. To neutralize hexavalent chrome: reduce with sodium bisulfite, sodium sulfite, ferrous sulfite or ferrous chloride and then neutralize with sodium bicarbonate to pH 7.5 to make chromic oxide (trivalent). Never flush to sewer. Major spills should be reported according to EPA regulations.

Waste Disposal:

Qualifies as a RCRA hazardous waste due to pH and presence of chromium in excess of 5 mg/l. Dispose at authorized waste disposal facility in accordance with local, state and federal requirements.

SECTION VIII: OCCUPATIONAL PROTECTIVE EQUIPMENT

Eye: Face shield, chemical goggles or chemical safety glasses with side shields should be worn.

Respiratory: NIOSH/MSHA-approved mist respirator for misty conditions such as cooling tower cleaning/maintenance operations where mists are likely.

Ventilation: Good industrial hygiene practice dictates that the work area be isolated and provided with adequate local exhaust ventilation or other controls to maintain the air concentration of sodium dichromate below $0.5/mg/10m^3$ (8 hr. TWA) as required by OSHA. The number of persons exposed should be minimized. A NIOSH/MSHA-approved respirator for dusts and mists must be used, if the air concentration exceeds the PEL, until the exposures are controlled.

Skin: Industrial grade protective rubber or plastic gloves should be worn.

Other: Rubber boots and aprons and daily change of work clothes are recommended. Launder contaminated clothing before wearing.

SECTION IX: PRECAUTIONARY MEASURES

Avoid skin and eye contact. Do not take internally. Keep container closed when not in use. Wash thoroughly after handling. Do not return spilled material to original container; remove and dispose. Do not inhale mists or vapors.

Wash after handling, and before eating, drinking and smoking. Refer to "Mogul Material Safety Data sheet Glossary of Terms" for additional information.

SECTION X: SHIPPING INFORMATION

DOT Label(s):	NA
DOT Proper Shipping Name:	NA
DOT Hazard Class/I.D. No:	NA
U.S. Surface Freight Classification:	Compounds, Industrial Water Treating, Liquid
Hazard Substance(s)/Reportable Quantities:	Sodium dichromate/1,000 lbs.

SECTION XI: ADDITIONAL INFORMATION

FDA:	None
USDA:	None
EPA:	Ingredients reported to TSCA Inventory.
Aquatic Toxicity:	Not tested

Date 2/86

Supersedes 8/85
WS-123

The information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of the suitability and completeness of information from all sources to assure proper use and disposal of these materials and the health of employees and customers.

AmeriGas
INDUSTRIAL GASES DIVISION
P.O. BOX 965
VALLEY FORGE, PA 19482

EMERGENCY PHONE NUMBERS:
(215) 337-8900—Valley Forge, PA
(415) 229-3050—Martinez, CA
(713) 944-1924—So. Houston, TX
(414) 258-6970—West Allis, WI

PROPYLENE
MATERIAL SAFETY DATA SHEET

PRODUCT NAME	CAS #
Propylene	115-07-1
TRADE NAME AND SYNONYMS	DOT I.D. No.:
Propylene; Propene	UN 1075
CHEMICAL NAME AND SYNONYMS	DOT Hazard Class:
Propylene; Propene	Flammable gas
ISSUE DATE AND REVISIONS	Formula:
25 November 1985	C_3H_6
	Chemical Family:
	Monolefin

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT

Propylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent at normal atmospheric (Continued on last page)

SYMPTOMS OF EXPOSURE

Inhalation: Moderate concentrations so as to exclude an adequate supply to the lungs causes dizziness, drowsiness, and eventual unconsciousness.

Contact with evaporating liquid could cause frostbite or freezing of dermal tissue.

TOXICOLOGICAL PROPERTIES

Has been reported that breathing high concentrations causes an asesthetic effect, however, the major property is the exclusion of an adequate supply of oxygen to the lungs.

Frostbite effects are a change in color of the skin to gray or white possibly followed by blistering.

RECOMMENDED FIRST AID TREATMENT

PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO PROPYLENE. RESCUE PERSONNEL SHOULD BE EQUIPPED WITH SELF-CONTAINED BREATHING APPARATUS AND BE COGNIZANT OF EXTREME FIRE AND EXPLOSION HAZARD.

Inhalation: Conscious persons should be assisted to an uncontaminated area and inhale fresh air. Quick removal from the contaminated area is most important. Unconscious persons should be moved to an uncontaminated area, given mouth-to-mouth resuscitation and supplemental oxygen. Further treatment should be symptomatic and supportive.

Dermal Contact or Frostbite: Remove contaminated clothing and flush affected areas with lukewarm water. DO NOT USE HOT WATER.

(Continued on last page)

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

Propylene is flammable in air. It can also form explosive mixtures in air. Reacts violently with nitrogen dioxide and nitrous oxide.

PHYSICAL DATA

BOILING POINT -53.9°F (-47.7°C)	LIQUID DENSITY AT BOILING POINT 38.3 lb/ft^3 (613.5 kg/m^3
VAPOR PRESSURE @ 70°F (21.1°C): 151 psia (1041 kPa)	GAS DENSITY AT 70°F, 1 atm .107 lb/ft^3 (1.71 kg/m^3)
SOLUBILITY IN WATER Slightly soluble	FREEZING POINT -301°F (-185°C)
EVAPORATION RATE Unknown; 99.9 + % volatile	SPECIFIC GRAVITY (AIR=1) @ 70°F (21.1°C) = 1.43
APPEARANCE AND ODOR Colorless gas with a mild olefinic odor.	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) -162°F (-108°C) C. C.	AUTO IGNITION TEMPERATURE 860°F (460°C)	FLAMMAGLE LIMITS % BY VOLUME LEL 2 UEL 11.1
EXTINGUISHING MEDIA Carbon dioxide, dry chemical or water spray		ELECTRICAL CLASSIFICATION Class I, Group D, See NFPA No. 70
SPECIAL FIRE FIGHTING PROCEDURES If possible, stop flow of gas supply and allow fuel to consume itself. Use water spray to cool surrounding containers.		
UNUSUAL FIRE AND EXPLOSION HAZARDS Propylene is heavier than air and may travel a considerable distance to a source of ignition. Should flame be extinguished and flow of gas continue, increase ventilation to prevent flammable mixture formation in low areas or pockets.		

REACTIVITY DATA

STABILITY		CONDITIONS TO AVOID
Unstable		N/A
Stable	X	
INCOMPATIBILITY (Materials to avoid) Oxides of nitrogen (NO_2, N_2O_4, and N_2O)		
HAZARDOUS DECOMPOSITION PRODUCTS Carbon monoxide when burned		
HAZARDOUS POLYMERIZATION		CONDITIONS TO AVOID
May Occur		N/A
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Evacuate all personnel from affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.

WASTE DISPOSAL METHOD

Do not attempt to dispose of waste or unused quantities. Return in the shipping container properly labeled, with any valve outlet plugs or caps secured and valve protection cap in place to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) Positive pressure air line with mask or self-contained breathing apparatus should be available for emergency use.		
VENTILATION Hood with forced ventilation	LOCAL EXHAUST To prevent accumulation above the LEL. MECHANICAL (Gen.) In accordance with electrical codes	SPECIAL N/A OTHER N/A
PROTECTIVE GLOVES Plastic or rubber		
EYE PROTECTION Safety goggles or glasses		
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower		

SPECIAL PRECAUTIONS*

SPECIAL LABELING INFORMATION

DOT Shipping Name: Liqufied Petroleum Gas I.D. No.: UN 1075
DOT Shipping Label: Flammable Gas DOT Hazard Class: Flammable Gas

SPECIAL HANDLING RECOMMENDATIONS

Use only in well-ventilated areas. Valve protection caps must remain in place unless container is secured with valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<200 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder, Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.

For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-1 and P-14 and Safety Bulletin SB-2.

SPECIAL STORAGE RECOMMENDATIONS

Protect cylinders from physical damage. Store in cool, dry, well-ventilated area of non-combustible construction away from heavily trafficked areas and emergency exits. Do not allow the temperature where cylinders are stored to exceed 130F (54C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in - first out" inventory system to prevent full cylinders being stored for excessive periods of time. Post "No Smoking or Open Flames" signs in the storage or use area. There should be no sources of ignition in the storage or use area.

For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1 and P-14 and Safety Bulletin SB-2.

SPECIAL PACKAGING RECOMMENDATIONS

Propylene is noncorrosive and may be used with any common structural material.

OTHER RECOMMENDATIONS OR PRECAUTIONS

Earth-ground and bond all lines and equipment associated with the propylene system. Electrical equipment should be non-sparking or explosion proof. Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder which has not been filled by the owner or with his (written) consent is a violation of Federal Law (49CFR).

*Various Government agencies (i.e., Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

HEALTH HAZARD DATA (Continued)

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

pressure which is equivalent to a partial pressure of 135 mm Hg. (ACGIH, 1985-86). OSHA (1985) TWA for LPG = 1,000 Molar PPM.

RECOMMENDED FIRST AID TREATMENT: (Continued)

A physician should see the patient if the cryogenic "burn" has resulted in blistering of the dermal surface or deep tissue freezing.

Ramming Mix

MATERIAL SAFETY DATA SHEET

J.H. FRANCE REFRACTORIES CO.

SNOW SHOE, PA 16874

TELEPHONE 814-387-6811

Date Prepared:
Nov. 19, 1985

Date Revised:

General Classification of Product: RAMMING MIXES

Trade Name/Synonym of Product:

MRM 7R
**MRM CAP
XT-5
MRM 80
*MRM 55P
MRM G
*MRM 90P
*MRM 85P
MRM 85
MRM 90
MRM LADLE RAM
NON FER RAM 6
NON FER RAM 1

Hazardous Ingredients — Section I

Ingredient	CAS Number
Crystalline Silica	7631-86-9
*Phosphoric Acid	7664-38-2
**Chrome Oxide	1310-73-2
Alum Sulphate	1344-28-1
Graphite	7782-42-5

Physical Data — Section II

Appearance & Color

White to black — Granular loose pack

Odor & Solubility

Acid odor
Insoluble in water, soluble in HF

Fire & Explosion Data — Section III

This material is noncombustible. Use extinguishing media appropriate to surrounding area.

Health Hazard Data — Section IV

Inhalation of all dusts are hazardous. Crystalline silica when inhaled may cause silicosis. This is a chronic slowly developing disease. Phosphoric acid may cause skin and eye burns. Chromium oxide may revert to the hexavalent form of chrome during firing with other materials (for example, Li, Na, K, Ca, Mg, etc.). Certain water insoluble chromium compounds are carcinogen. Used product should be disposed of as hazardous waste if hexalent chromium compounds are detectable.

Reactivity **Section V**

This material is stable under ordinary conditions.

Emergency and First Aid Procedures **Section VI**

Terminate exposure. If affected, consult physician. Flush eyes and skin with water.

Spill, Leak, and Disposal **Section VII**

Avoid inhalation of all dusts. Protect eyes and skin. Consult with local, state, and federal authorities on waste removal.

Special Protection Information **Section VIII**

Wear NIOSH approved safety masks, eye glasses, and gloves. Ventilate where necessary.

Special Precautions and Comments **Section IX**

None

Prepared By: I. Dulberg

Title: Technical Manager

Although reasonable care has been taken in the preparation of this MSDS, J. H. France Refractories Co. extends no warrantees, makes no representation and assumes no responsibilities as to the accuracy or suitability of such information for application to the purchaser's intended purposes or for consequences of its use.

Form Approved
Budget Bureau No. 44-R1387

U.S. DEPARTMENT OF LABOR

WORKPLACE STANDARDS ADMINISTRATION

Bureau of Labor Standards

MATERIAL SAFETY DATA SHEET

Ridge Nu Clear

SECTION I

MANUFACTURER'S NAME: Ridge Tool Company	EMERGENCY TELEPHONE NO.: 216-323-5581
ADDRESS (Number, Street, City, State, and ZIP Code): 400 Clark Street, Elyria, Ohio 44035	
CHEMICAL NAME AND SYNONYMS: Petroleum Cutting Fluid	TRADE NAME AND SYNONYMS: Ridge Nu-Clear
CHEMICAL FAMILY: Sulfurized Petroleum Hydrocarbons	FORMULA: Confidential

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS	N/A		BASE METAL	N/A	
CATALYST	N/A		ALLOYS	N/A	
VEHICLE	N/A		METALLIC COATINGS	N/A	
SOLVENTS	N/A		FILLER METAL PLUS COATING OR CORE FLUX	N/A	
ADDITIVES	N/A		OTHERS	N/A	
OTHERS	N/A				

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
All ingredients used in the manufacturing of this product meet current OSHA standards.		

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	487°F	SPECIFIC GRAVITY (H_2O=1)	±0.883
VAPOR PRESSURE (mm Hg.)	N/A	PERCENT VOLATILE BY VOLUME (%)	0
VAPOR DENSITY (AIR=1)	N/A	EVAPORATION RATE (water =1)	<1
SOLUBILITY IN WATER	None		
APPEARANCE AND ODOR	Clear, dark amber liquid, mild sulfur odor		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used): (COC) 385°F	FLAMMABLE LIMITS	Lel: 1.0	Uel: 6.0
EXTINGUISHING MEDIA: Foam, dry chemical; CO_2			
SPECIAL FIRE FIGHTING PROCEDURES: Fight as Class B fire			
UNUSUAL FIRE AND EXPLOSION HAZARDS: None			

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
Not Known

EFFECTS OF OVEREXPOSURE
Prolonged or repeated skin contact may cause mild skin irritation.

EMERGENCY AND FIRST AID PROCEDURES
Flush eyes copiously with water and contact a physician. For ingestion do not induce vomiting; call a doctor. Wash skin with warm, soapy water.

SECTION VI REACTIVITY DATA

STABILITY	**UNSTABLE**		**CONDITIONS TO AVOID** Avoid open flame or sparks
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*
Strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS
Upon combustion, hydrogen chloride, hydrogen sulphide, CO & CO_2

HAZARDOUS POLYMERIZATION	**MAY OCCUR**		**CONDITIONS TO AVOID**
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Soak up on oil absorbent material. Keep petroleum products out of streams and waterways.

WASTE DISPOSAL METHOD
Incinerate material in compliance with Federal, State and local laws or dispose in authorized landfill.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*
Not recommended.

VENTILATION	**LOCAL EXHAUST**	**SPECIAL** Not required
	MECHANICAL *(General)*	**OTHER** Not required

PROTECTIVE GLOVES Oil resistant	**EYE PROTECTION** Safety glasses or goggles

OTHER PROTECTIVE EQUIPMENT
Oil impervious apron if needed

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Avoid open flame or sparks.

OTHER PRECAUTIONS
None

3/83

Gene Revolinsky
Manager, Product Engineering

RIGILINE PRODUCTS

CORROSION RESISTANT MATERIALS

RIGIFLAKE 480 SERIES
Protective Coating Systems
Tech. Data Sheet

I. DESCRIPTION

RIGIFLAKE 480 Series is the general designation assigned to a group of coatings formulated from highly chemical resistant polyester resins reinforced with intermediate sized inert flakes. These materials are cured with a liquid catalyst and, by nature of the overlapping flakes, form a structurally reinforced coating with excellent resistance to permeation and abrasion. Film thicknesses of 15-20 mils per coat can be applied by brush or spray to produce quality high build protection at low applied cost.

Two main resin grades in the RIGIFLAKE 480 Series are available. Specific grade numbers and general chemical resistance advantages are listed below.

GRADE NUMBER

RIGIFLAKE 485	Resistant to mineral acids, alkalies and salts.
→ RIGIFLAKE 487	Resistant to mineral and oxidizing acids.

Special grades are available for environments containing fluorides, solvents, etc.

PHYSICAL PROPERTIES

Tensile	2731 psi
Flexural	5195 psi
Abrasion Resistance	Excellent
Color	Standard is gray - other colors available upon request.

II. USE

RIGIFLAKE 480 Series coatings are used to protect steel and other surfaces from attack by highly corrosive fumes and spillage at temperature to 250°F. It is also used for immersion service in mild chemical environments to 145°F. The low installed cost makes these coatings ideal for applications on chemical tank exteriors, structural steel, duct, etc.

HEIL PROCESS EQUIPMENT CORPORATION 12901 ELMWOOD AVE. • CLEVELAND, OHIO 44111
AREA CODE 216 252-4141 • TELEX 98-5318

III. ORDERING

A. Installed Products

Specify the selected RIGIFLAKE grade number in a minimum thickness of 30 mils applied in two nominal 15 mil coats.

Consult your Heil representative for assistance on specific applications.

B. Material Orders

Liquid components for all grades of RIGIFLAKE in the 480 Series are available for self-installation. Standard containers are listed below and come complete with C-50R catalyst in separate container.

RIGIFLAKE 480 Series Liquids:

1 gallon 5 gallons 55 gallons

Theoretical coverage: at 30 mils thickness 1 gallon covers 50 sq. ft.

All orders should state the proper grade number and indicate if brush (B) or spray (S) grade is desired.

IV. CHEMICAL RESISTANCE

The table below is offered as a guide for the use of RIGIFLAKE 480 Series in fume and splash environments. The ratings are based upon our extensive research and experience. However, no guarantee is expressed or implied. Test samples are available to the user to help determine the suitability of these materials for his specific application.

Environment	Temperature 70°F.	150°F.	Environment	Temperature 70°F.	150°F.
Asphalt	R	R	Hydrochloric Acid	R	R
Crude Oil – Sour	R	R	Lead Acetate	R	R
Crude Oil – Sweet	R	R	Magnesium Carbonate	R	R
Furnace Oil	R	R	Magnesium Chloride	R	R
Gasoline	R	R	Magnesium Sulphate	R	R
Kerosene	R	R	Phosphoric Acid	R	R
			Potassium Alum	R	R
Aluminum Chloride	R	R	Potassium Chloride	R	R
Aluminum Nitrate	R	R	Potassium Dichromate	R	R
Aluminum Sulphate	R	R	Potassium Nitrate	R	R
Ammonium Chloride	R	R	Potassium Sulphate	R	R
Ammonium Sulphate	R	R	Silver Nitrate	R	R
Ammonium Nitrate	R	R	Sodium Bicarbonate	R	NR
Barium Carbonate	R	R	Sodium Bisulphate	R	NR
Barium Chloride	R	R	Sodium Carbonate	R	R
Calcium Sulphate	R	R	Sodium Chloride	R	R
Copper Chloride	R	R	Sodium Ferrocyanide	R	R
Ferric Chloride	R	R	Sulfuric Acid	R	R
Ferric Nitrate	R	R	Trisodium Phosphate	R	R
Ferrous Chloride	R	R	Zinc Chloride	R	R
Ferrous Sulphate	R	R	Zinc Sulphate	R	R

R – Recommended for Service NR – Not Recommended for Service

RIGILINE PRODUCTS

CORROSION RESISTANT MATERIALS

RIGIFLAKE 480 SERIES
Protective Coating Systems
Application Guide

I. Surface Preparation - Steel should be sandblasted to white metal in accordance with Steel Structure Painting Council Specification SP 5-63.

II. Priming - No primer is required for steel surfaces which have been freshly blasted. Consult Heil Process Equipment for specific recommendations of RIGIFLAKE to other substrates.

III. Application - RIGIFLAKE materials in the 480 series are applied by brush or spray in thicknesses of 15-20 mils per coat. Roller application is not recommended. Spray applications require highly specialized equipment consequently only brush applications are covered in this bulletin.

Two coats are recommended to achieve a 30-40 mil coating. Each coat is applied in the same manner and is generally as follows:

A. Use only clean dry equipment.

B. Components for any RIGIFLAKE material in the 480 Series consist of a thixotropic resin-flake liquid and a red catalyst. These materials are mixed in ratios outlined below until a uniform color is obtained. Catalyst quantity will vary with temperatures as indicated.

RIGIFLAKE GRADE NUMBER	C-50 R CATALYST REQUIRED	
	60 - 75°F	75 - 90°F
1 gal. RIGIFLAKE 485	3 fl. oz.	1-1/2 fl. oz.
→ 1 gal. RIGIFLAKE 487	1-1/2 fl. oz.	1 fl. oz.

Note: Material should be used immediately after blending of the liquids.

12901 ELMWOOD AVE. • CLEVELAND, OHIO 44111
AREA CODE 216 252-4141 • TELEX 98-5310

C. Apply each coat of catalyzed RIGIFLAKE with a bristle brush. Spread evenly using medium pressure. Check thickness frequently with a wet film tester to insure a nominal 15-20 mil application. Initial coat must be hard and firm prior to additional applications.

D. After the second coat of RIGIFLAKE material has hardened, the lining can be spark tested to insure 100% continuity. A 2000-volt spark tester is recommended. Soft spots or other defective areas should be removed to white metal and repaired with catalyzed resin as outlined above.

E. Clean equipment and tools with Solvent T-2, methyl ethyl ketone or lacquer thinner. Clean up must be done before RIGIFLAKE materials harden.

IV. Curing - RIGIFLAKE resins are thermosetting materials and will harden within 3-4 hours at 75°F. Maximum chemical resistance is obtained in 18 hours at 75°F. Increased temperatures will speed the cure while decreased temperatures will retard the cure.

V. Precautions -

A. RIGIFLAKE resins will not harden at temperatures below 60°F. Avoid application below this temperature unless auxiliary heat is provided. Resins should not be applied to surfaces in excess of 100°F.

B. Areas which have been coated with RIGIFLAKE should remain moisture free until hardened.

C. Avoid breathing of fumes. Use with adequate ventilation. Closed tanks require an air change once in every 7 minutes.

D. Catalyst C-50R may cause skin rash or irritation. Keep free from contamination. Wash immediately with soap and water in the event of contact.

E. Open flames, smoking, welding, etc. are not permitted within 50 feet of an area during application.

F. Store in a cool place away from fire and flame. Use within 6 months.

Resin Bonded Abrasive

U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

PRODUCT

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917) 3-20-86

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
STERLING ABRASIVE PRODUCTS CO.	(419) 447-9321

ADDRESS (Number, Street, City, State, and ZIP Code)
525 WALL STREET, TIFFIN, OHIO 44883

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
RESIN BONDED ABRASIVE PRODUCT	A and/or C ABRASIVE & B BOND
CHEMICAL FAMILY: OXIDE and/or CARBIDE & PHENOLIC	FORMULA: AL_2O_3 and/or SiC & PHENOLIC RESIN BOND

SECTION II - HAZARDOUS INGREDIENTS

CHEMICAL NAME	COMMON NAME	GAS #	OSHA PEL	ACGIH TLV	CARCINOGEN Y/N
Aluminum Oxide and/or	Alumina	1344-28-1	15 Mg/M^3	10 Mg/M^3	N
Silicon Carbide	Carbide	7440-67-21	15 Mg/M^3	10 Mg/M^3	N
MAY CONTAIN ONE OR MORE OF THE FOLLOWING:					
Zirconium Dioxide	Zirconia	409-21-2	5 Mg/M^3	5 Mg/M^3	N
Titanium Dioxide	Titania	13463-67-7	15 Mg/M^3	10 Mg/M^3	N
Glass-Dust or Fiber	Frit/Fiberglass	N/A		10 Mg/M^3	N
Calcium Oxide	Lime	1305-78-8	5 Mg/M^3	2 Mg/M^3	N
Sulfer	N/A	7704-34-2		10 Mg/M^3	N
Fluorides (As F)	N/A	N/A	2.5 Mg/M^3	2.5 Mg/M^3	N
Barium Sulfate	Barytes	7727-43-7	0.5 Mg/M^3	0.5 Mg/M^3	N
Calcium Silicate	Wollastonite	1344-95-2		10 Mg/M^3	N
Calcium Carbonate	Whiting			20 Mg/M^3	N
Paraffin	Wax	8002-74-2		2 Mg/M^3	N
Creosote	Carbosota	8001-58-9	0.2 Mg/M^3	0.2 Mg/M^3	Y
Iron Sulfide	Pyrites	12068-85-8	2 Mg/M^3	2 Mg/M^3	N

SECTION III - PHYSICAL DATA

BOILING POINT (°F.)	N/A	SPECIFIC GRAVITY (H_2O=1)	N/A
VAPOR PRESSURE (mm Hg.)	N/A	PERCENT, VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=1)	N/A	EVAPORATION RATE (_____ _____ =1)	N/A
SOLUBILITY IN WATER	Slight		
APPEARANCE AND ODOR	Solid - may give off some odor in use		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
N/A	N/A	N/A	N/A

EXTINGUISHING MEDIA
Water or CO_2

SPECIAL FIRE FIGHTING PROCEDURES
None

UNUSUAL FIRE AND EXPLOSION HAZARDS
None

 N/A = Not Applicable

(Continued on reverse side)

SECTION V · HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: 10 Mg/M^3 AL_2O_3 or SiC

EFFECTS OF OVEREXPOSURE

Inhalation - coughing, shortness of breath; Skin - irritation; Eyes - irritation;

Ingestion - no None effects but not recommended.

EMERGENCY AND FIRST AID PROCEDURES

Inhalation - remove to fresh air. Obtain medical assistance if needed.

Skin - wash with soap & water; Eyes - flush with large amounts of clean water -

obtain medical assistance.

SECTION VI · REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		Avoid strong acids, bases, solvents, extreme heat or
	STABLE	X	cold or sudden temperature change (avoid moisture,
INCOMPATABILITY (Materials to avoid) Water-BX, BN, BZ BONDS only			humidity, condensation - BX, BN & BZ BONDS only)

HAZARDOUS DECOMPOSITION PRODUCTS

Dust arising from use should be controlled within TLV's

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		N/A
	WILL NOT OCCUR	X	N/A

SECTION VII · SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Normal clean-up

No special steps needed

WASTE DISPOSAL METHOD

Standard landfill methods consistent with federal, state and local laws.

SECTION VIII · SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) See OSHA 29 CFR 1910.134

MSHA or NIOSH approved respirator may be required if TLV's exceeded.

VENTILATION		
	LOCAL EXHAUST See OSHA 29 CFR 1910.94 Recommended - see ANSI Z43.1	SPECIAL Dependant of workpiece
	MECHANICAL (General) See OSHA 29 CFR 1910.94 Recommended - see ANSI Z43.1	OTHER N/A

PROTECTIVE GLOVES	EYE PROTECTION
As desired by operator	Required - see OSHA 29 CFR 1910.133

OTHER PROTECTIVE EQUIPMENT

Apron and face shield as desired - Hearing Protection - see OSHA 29 CFR 1910.95

SECTION IX · SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid mechanical damange; handle and store in accordance with ANSI B7.1 - allow wheels to warm to room temperature before using. Always use wheels in accordance with ANSI

OTHER PRECAUTIONS

B7.1 ANSI Z43.1 and OSHA 29 CFR 1910.215. Never use wheels suspected of being dropped, cracked or damaged, always use a safety guard. Never exceed the maximum operating speed marked on the wheel.

GPO 934-190

STAINLESS STEEL

NATIONAL FORGE COMPANY - IRVINE, PENNSYLVANIA 16329

MATERIAL SAFETY DATA SHEET

SECTION I

DATE 11/25/85

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
National Forge Company	814/563-7522
ADDRESS (NUMBER, STREET, CITY, & ZIP CODE) Irvine, Warren County, PA 16329	
PRODUCT NAME Stainless Steel	CHEMICAL FAMILY Steel
GRADES	

SECTION II CHEMICAL COMPONENTS

	C A S NUMBER	RANGE %	ACGIH TLV (UNITS)	OSHA PEL
Iron (Fe)	7439-89-6	Balance	5 mg/m^3	10 mg/m^3
Chromium (Cr)	7740-47-3	15-20.0	.05 mg/m^3	0.1 mg/m^3
Nickel (Ni)	7440-02-0	1.25-14.0	1.0 mg/m^3	1.0 mg/m^3
Manganese (Mn)	7439-96-5	2.00 max.	1.0 mg/m^3	5.0 mg/m^3
Molybdenum (Mo)	7439-98-7	.01-3.00	5 mg/m^3	5 mg/m^3
Silicon (Si)	7740-21-3	1.00 max.	10 mg/m^3	15 mg/m^3
Titanium (Ti)	7440-32-6	.60 max.	10 mg/m^3	15 mg/m^3
Tantalum (Ta)	7440-25-7	1.0 max.	5 mg/m^3	5 mg/m^3
Cobalt (Co)	7440-48-4	.30 max.	0.1 mg/m^3	0.1 mg/m^3
Trace Elements	N/A	Lt. 1.0	N/A	N/A

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	N/A	SPECIFIC GRAVITY (H_2O=1)	7.6-7.8
VAPOR PRESSURE (MM HG.)	N/A	PERCENT VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=1)	N/A	EVAPORATION RATE (=1)	N/A
SOLUBILITY IN WATER	N/A	MELTING POINT	2800°F
APPEARANCE & ODOR	Metallic & Odorless Solid		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)	N/A	FLAMMABLE LIMITS	N/A	LEL	UEL
EXTINGUISHING MEDIA	N/A				
SPECIAL FIRE FIGHTING PROCEDURES	None				
UNUSUAL FIRE EXPLOSION HAZARDS	None				

N/A = NOT APPLICABLE
UN = UNKNOWN

SECTION V - HEALTH HAZARD DATA

(X) MAJOR EXPOSURE HAZARD:	INHALATION [X]	SKIN CONTACT [ ]	SKIN ABSORPTION [ ]	INGESTION [ ]

NOTE: STEEL PRODUCTS IN THE NATURAL STATE DO NOT PRESENT AN INHALATION, INJECTION, OR CONTACT HAZARD. HOWEVER, OPERATIONS SUCH AS BURNING, WELDING, SAWING, BRAZING, OR GRINDING MAY RESULT IN THE FOLLOWING EFFECTS IF EXPOSURES EXCEED PERMISSIBLE LIMITS: (exposures to fume and dust)

. Could possibly aggravate chronic diseases or disorders of the respiratory system.

. The NTP and IARC consider chromium and certain chromium compounds to be known human "CARCINOGENS" and nickel and certain nickel compounds to be possible/probable human carcinogens.

. Maintaining iron oxide fumes and dust below its TLV should be sufficient to control the airborne concentrations of the other constituents.

. Titanium, tantalum, cobalt - low in toxicity, mild irritants to the eyes, skin, and dust also has irritating effects to the upper respiratory tract.

FIRST AID AND MEDICAL EMERGENCY PROCEDURES: Eye and skin contact should not pose a significant health hazard. Inhalation: Remove from the exposed area unless proper respiratory protection is worn. Ingestion is not considered a health hazard. Always utilize good hygiene procedures before eating and leaving the work environment.

SECTION VI - REACTIVITY DATA

STABLE [X]	UNSTABLE [ ]	CONDITIONS TO AVOID: N/A

INCOMPATIBILITY (MATERIALS TO AVOID): Acids

DECOMPOSITION PRODUCTS: Welding and burning on this product may cause the generation of a variety of noxious fumes and gases (examples: chrome fume and carbon monoxide).

HAZARDOUS POLYMERIZATION	MAY OCCUR [ ]	CONDITIONS TO AVOID
	WILL NOT OCCUR [X]	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED/PRECAUTIONS WHILE HANDLING/STORING: N/A

WASTE DISPOSAL METHOD: All excess products can be disposed of or recycled for further use. They can be disposed of in a permitted hazardous waste landfill or disposed of by other methods which are in accordance with state, local, and/or federal regulations.

SECTION VIII - PERSONNEL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Ventilation should be sufficient to maintain exposure levels below the applicable exposure limit. Eye and skin irritation is not anticipated to pose a significant health hazard. When controls of exposure are not sufficient to lower exposure to proper PEL, utilize a NIOSH-approved respirator for dust and fumes of metals within the use limits of the respirator.

GLOVES: Utilize as needed/dependent on personal job operations.

EYE PROTECTION: Wear eye protection when burning, grinding or welding of this product.

PREPARED BY

Thomas F. Fitzgerald
Safety Supervisor

Health Hazard Data

Stainless Steel

Health Effects/Signs and Symptoms:

Note: Despite the fact that steel products in their natural physical form do not pose any health hazard, it is possible that fumes generated from burning, cutting, grinding, etc., may produce air concentrations higher than the permissible exposure limits for humans. Particular attention should be directed to all listed elements and the hazards they could present. The following is a list of fumes or dusts that may be generated from our steel products and the health hazards associated with chronic overexposure to them.

Nickel (Ni)

Nickel fumes and dusts are respiratory irritants and may cause a severe pneumonitis. Skin contact with nickel and its compounds may cause al allergic dermatitis. The resulting skin rash is often referred to as "nickel itch." Nickel and its compounds may produce eye irritation, particularly on the inner surfaces of the eyelids. Animal and/or epidemiology studies have linked nickel and certain nickel compounds to an increased incidence of cancer of the lungs and nasal passages.

Chromium (Cr)

The toxicity and health hazards of chromium are heavily dependent upon its oxidation state. The elemental, divalent, and trivalent forms are very low in toxicity. The hexavalent form (examples: chromatis and chromic acid) is very toxic and can produce both acute and chronic effects. Adverse effects on the skin may include ulcerations, irritative dermatitis, and allergic skin reactions. Adverse affects on the respiratory system may include bronchospasm, edema, hypersecretion, bronchitis, irritation, allergic asthmatic reactions, and ulceration and perforation of the nasal septum. Respiratory symptoms may include coughing and wheezing, shortness of breath, and nasal itch. Eye irritation or inflammation can also be produced. Exposures to some hexavalent chromium compounds have also been shown to be associated with an increased risk of lung cancer.

Iron (Fe)

Subjecting iron and alloys containing iron to high temperature (example: welding) will cause the formation of iron oxides. Long-term exposure to iron oxide fumes or dusts has been associated with a benign lung condition known as siderosis which is observable as an X-ray change. No physical impairment of lung function has been linked to siderosis.

Manganese (Mn)

Manganese intoxication is usually due to the oxide or salts of manganese, elemental manganese exhibits very low toxicity. The dusts and fumes can act as minor irritants to the eyes and respiratory tract. Both acute and chronic exposures may adversely affect the central nervous system, but symptoms are more likely to occur after at least 1 or 2 years of prolonged or repeated exposures. Early symptoms may include weakness, in lower extremities, sleepiness, salivation, nervousness, and apathy. In more advanced stages, severe muscular incoordination, impaired speech, spastic walking, mask-like facial expression and uncontrollable laughter may occur. Manganese fumes have also been reported to result in metal fume fever, a flu-like syndrome with symptoms such as dizziness, chills, fever, headache, and nausea. An increased incidence of pneumonia, bronchitis, and pneumonitis has been reported in some workers' populations exposed to manganese. Animal studies indicate that manganese exposure may increase susceptibility to bacterial and viral infections.

Silicon (Si)

This is considered to be a nuisance particulate by ACGIH.

Molybdenum (Mo)

Molybdenum and its compounds generally exhibit a low order of toxicity; however, soluble compounds (such as molybdenum trioxide) are considerably more toxic. Molybdenum trioxide may produce irritation of the eyes, nose, and throat. In animals, soluble molybdenum compounds have also caused weight loss, diarrhea, loss of coordination, pneumoconiosis (accumulation of particles in the lungs), breathing difficulties, anemia, and colic. Animal data also suggests that repeated exposure might be associated with gout. Pneumoconiosis with X-ray findings and subjective symptoms has been observed in a small number of workers exposed to metallic molybdenum and molybdenum trioxide; however, no physical impairment of lung function has been linked to this condition.

Aluminum (Al)

Particles of aluminum deposited in the eye may cause irreversible tissue damage of the cornea. Aluminum salts may cause dermatitis, eczema, conjunctivitis, and irritation of the mucous membranes of the upper respiratory tract. Long-term inhalation exposure to aluminum dusts or fumes has been associated with a fibrotic lung condition known as Shaver's disease; however, the evidence for this is not conclusive since affected workers were exposed to other substances (such as silica) as well. Symptoms of this condition may include shortness of breath, cough, and fatigue.

Titanium (Ti)

Titanium and its compounds are, in general, considered to be physiologically inert and of very low toxicity. Titanium dioxide dust has been reported to be a mild pulmonary irritant in humans. Most animal experiments have shown that inhalation of titanium and its oxides result in mild or transient effects on the respiratory system.

Tantalum (Ta)

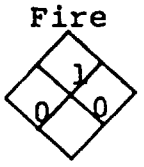
Metallic tantalum and its oxides have a relatively low order of toxicity. Although some animal experiments have suggested that inhalation of tantalum or its oxides may produce benign and nonfibrotic pulmonary effects, no adverse effects have been reported as a result of industrial exposures. There have been some reports of adverse skin reactions due to tantalum; however, most evidence indicates that tantalum is relatively inert with respect to skin contact.

Cobalt (Co)

Cobalt dust and fumes are mildly irritating to the eyes, skin, and upper respiratory tract. An allergic dermatitis may be produced especially in the skin areas subject to friction such as the creases of the elbow, knee, and ankle. Inhalation of cobalt dust and fumes may result in an asthma-like respiratory disease with symptoms such as cough and shortness of breath. In some instances, this condition progresses to interstitial pneumonia with marked fibrosis. As a result, permanent disability or even death may occur.

Statex R. Beads

Fire



CITIES SERVICE COMPANY

MATERIAL SAFETY DATA SHEET

Date 8/25/78

SECTION 1 - Identification

Product Name Statex R Beads
Chemical Name Carbon Black
Chemical Family Carbon

Manufacturer's Name Cities Service Company
Manufacturer's Address P. O. Box 300
Tulsa, Oklahoma 74102
Position or Department Toxicology Dept.
Telephone Number (918) 586-3984

SECTION 2 - Hazard Rating Non-Fire

Hazard Classification: Health 0 Flammability 1 Reactivity 0

Composition: Component	Concentration	Criterion and Value
Carbon	100	TLV 3.5 mg/m^3*

SECTION 3 - Physical Properties

Appearance and Odor Amorphous black, odorless
Boiling Point (°F) NA Specific Gravity (Water=1) 1.7-1.9 Solubility in Water negligible
Vapor Pressure (mm Hg) NA Vapor Density (Air=1) NA Evaporation Rate (____=1) NA
Reacts if Exposed to: Light No Air No Heat No Water No Strong Oxidizer No

SECTION 4 - Fire or Explosion Data

Flash Point (°F) NA Autoignition Temperature (°F) NA LEL (%) NA UEL (%) NA
Extinguishing Media Water spray

Special Firefighting Procedure Normal fog or nozzle jet application and/or exclusion of air.

Unusual Fire or Explosion Protection None

SECTION 5 - Health Data

TLV 3.5 mg/m^3 Criterion OSHA, 1976 ACGIH, 1977
Effects of Overexposure ---

Emergency and First Aid Procedures
Ingestion No consequences.
Inhalation Remove from exposure. Check with physician.
Skin Normal washing with soap and water.
Eye Rinse with water.

Irritant: Skin No Eye No Inhalation No

Other Data ---

"APPROVED AS ESSENTIALLY SIMILAR TO O S H A FORM 20 (PREVIOUSLY L S B-005-41)"

72-68 (6-75) * OSHA, 1976 ACGIH, 1977 NA = Not Applicable

SECTION 6 - Reacitivity

Stable Yes Unstable --- Conditions to Avoid ---
Incompatibility NA

Hazardous Decompositon Products Thermal CO, CO_2

Hazardous Polymerization: No X Yes -- Conditions to Avoid --

Corrosive: No X Yes -- Materials --

SECTION 7 - Spills and Leaks

Steps to be Taken in Case Material is Released or Spilled Vacuum up.

Waste Disposal Precautions Bury, use as landfill in accordance with local, state and federal regulations.

SECTION 8 - Special Protection

Respirators: No _____ Yes X Type Dust mask above TLV
Ventilation: Use the guidelines recommended by the American Conference of Governmental Industrial Hygienists in the current edition of "Industrial Ventilation", considering the TLV, Lower Explosive (Flammable) Limit and conditions under which this product is used.

Gloves Synthetic or rubber Other --
Eye Protection Safety glasses --

SECTION 9 - Special Precautions

Handling and Storage Keep in closed containers.

DOT Hazard Label Required: No X Yes _____ Specify --

Other Precautions -- Entrance into closed storage tanks -- use appropriate respirator or air line for possible exposure to carbon monoxide.

"APPROVED AS ESSENTIALLY SIMILAR TO OSHA FORM 20 (PREVIOUSLY LSB-005-4)"

The suggestions and data provided herewith are based upon test and information which we believe to be reliable. However, we make no guarantee with respect thereto and assume no liability resulting from the use thereof. Users should make their own investigations to determine the suitability of the information or products for their particular purpose. Furthermore, nothing contained therein is intended as permission, inducement or recommendation to violate any laws or to practice any invention oovered by existing patents.

Low Allow Steel Grades

NATIONAL FORGE COMPANY - IRVINE, PENNSYLVANIA 16329

MATERIAL SAFETY DATA SHEET

SECTION I

DATE 11/25/85

MANUFACTURER'S NAME: National Forge Company	EMERGENCY TELEPHONE NO.: 814/563-7522
ADDRESS (NUMBER, STREET, CITY, & ZIP CODE): Irvine, Warren County, PA 16329	
PRODUCT NAME: Low Alloy Steel Grades	CHEMICAL FAMILY: Steel
GRADES	

SECTION II CHEMICAL COMPONENTS

	C A S NUMBER	RANGE %	ACGIH TLV (UNITS)	OSHA PEL
Iron (Fe)	7439-89-6	Balance	5 mg/m^3	10 mg/m^3
Manganese (Mn)	7439-96-5	.25-2.05	1 mg/m^3	5 mg/m^3
Chromium (Cr)	7740-47-3	.01-1.60	.05 mg/m^3	0.1 mg/m^3
Carbon (C)	7740-44-0	.01-1.20	N/A	N/A
Nickel (Ni)	7740-02-0	.01-.35 max	1 mg/m^3	1 mg/m^3
Copper (Cu)	7740-58-0	.01-.45	0.2 mg/m^3	0.1 mg/m^3
Silicon (Si)	7740-21-3	.15-.35	10 mg/m^3	15 mg/m^3
Trace Elements	N/A	Lt. 1.0	N/A	N/A

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	N/A	SPECIFIC GRAVITY (H_2O.I)	7.6-7.8
VAPOR PRESSURE (MM HG.)	N/A	PERCENT VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=I)	N/A	EVAPORATION RATE (=I)	N/A
SOLUBILITY IN WATER	N/A	MELTING POINT	2800°F
APPEARANCE & ODOR	Metallic & Odorless Solid		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED)	N/A	FLAMMABLE LIMITS	N/A	LEL	UEL
EXTINGUISHING MEDIA	N/A				
SPECIAL FIRE FIGHTING PROCEDURES	None				
UNUSUAL FIRE EXPLOSION HAZARDS	None				

N/A = NOT APPLICABLE
UN = UNKNOWN

SECTION V - HEALTH HAZARD DATA

(X) MAJOR EXPOSURE HAZARD:	INHALATION [X]	SKIN CONTACT [ ]	SKIN ABSORPTION [ ]	INGESTION [ ]

NOTE: STEEL PRODUCTS IN THE NATURAL STATE DO NOT PRESENT AN INHALATION, INJECTION, OR CONTACT HAZARD. HOWEVER, OPERATIONS SUCH AS BURNING, WELDING, SAWING, BRAZING, OR GRINDING MAY RESULT IN THE FOLLOWING EFFECTS IF EXPOSURES EXCEED PERMISSIBLE LIMITS: (exposures to fume and dust)

. Could possibly aggravate chronic diseases or disorders of the respiratory system.

. The NTP and IARC consider chromium and certain chromium compounds to be known human "CARCINOGENS" and nickel and certain nickel compounds to be possible/probable human carcinogens.

. Maintaining iron oxide fumes and dust below its TLV should be sufficient to control the airborne concentrations of the other constituents.

FIRST AID AND MEDICAL EMERGENCY PROCEDURES: Eye and skin contact should not pose a significant health hazard. Inhalation: Remove from the exposed area unless proper respiratory protection is worn. Ingestion is not considered a health hazard. Always utilize good hygiene procedures before eating and leaving the work environment.

SECTION VI - REACTIVITY DATA

STABLE [X]	UNSTABLE [ ]	CONDITIONS TO AVOID: N/A
INCOMPATIBILITY (MATERIALS TO AVOID): Acids		
DECOMPOSITION PRODUCTS: Welding and burning on this product may cause the generation of a variety of noxious fumes and gases (examples: chrome fume and carbon monoxide).		
HAZARDOUS POLYMERIZATION	MAY OCCUR [ ] / WILL NOT OCCUR [X]	CONDITIONS TO AVOID

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED/PRECAUTIONS WHILE HANDLING/STORING: N/A
WASTE DISPOSAL METHOD: All excess products can be disposed of or recycled for further use. They can be disposed of in a permitted hazardous waste landfill or disposed of by other methods which are in accordance with state, local, and/or federal regulations.

SECTION VIII - PERSONNEL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Ventilation should be sufficient to maintain exposure levels below the applicable exposure limit. Eye and skin irritation is not anticipated to pose a significant health hazard. When controls of exposure are not sufficient to lower exposure to proper PEL, utilize a NIOSH-approved respirator for dust and fumes of metals within the use limits of the respirator.
GLOVES: Utilize as needed/dependent on personal job operations.
EYE PROTECTION: Wear eye protection when burning, grinding or welding of this product.

PREPARED BY

Thomas F. Fitzgerald

Thomas F. Fitzgerald
Safety Supervisor

Health Hazard Data

Low Alloy Steel Grades

Health Effects/Signs and Symptoms:

Note: Despite the fact that steel products in their natural physical form do not pose any health hazard, it is possible that fumes generated from burning, cutting, grinding, etc., may produce air concentrations higher than the permissible exposure limits for humans. Particular attention should be directed to all listed elements and the hazards they could present. The following is a list of fumes or dusts that may be generated from our steel products and the health hazards associated with chronic overexposure to them.

Nickel (Ni)

Nickel fumes and dusts are respiratory irritants and may cause a severe pneumonitis. Skin contact with nickel and its compounds may cause al allergic dermatitis. The resulting skin rash is often referred to as "nickel itch." Nickel and its compounds may produce eye irritation, particularly on the inner surfaces of the eyelids. Animal and/or epidemiology studies have linked nickel and certain nickel compounds to an increased incidence of cancer of the lungs and nasal passages.

Chromium (Cr)

The toxicity and health hazards of chromium are heavily dependent upon its oxidation state. The elemental, divalent, and trivalent forms are very low in toxicity. The hexavalent form (examples: chromatis and chromic acid) is very toxic and can produce both acute and chronic effects. Adverse effects on the skin may include ulcerations, irritative dermatitis, and allergic skin reactions. Adverse affects on the respiratory system may include bronchospasm, edema, hypersecretion, bronchitis, irritation, allergic asthmatic reactions, and ulceration and perforation of the nasal septum. Respiratory symptoms may include coughing and wheezing, shortness of breath, and nasal itch. Eye irritation or inflammation can also be produced. Exposures to some hexavalent chromium compounds have also been shown to be associated with an increased risk of lung cancer.

Iron (Fe)

Subjecting iron and alloys containing iron to high temperature (example: welding) will cause the formation of iron oxides. Long-term exposure to iron oxide fumes or dusts has been associated with a benign lung condition known as siderosis which is observable as an X-ray change. No physical impairment of lung function has been linked to siderosis.

Manganese (Mn)

Manganese intoxication is usually due to the oxide or salts of manganese, elemental manganese exhibits very low toxicity. The dusts and fumes can act as minor irritants to the eyes and respiratory tract. Both acute and chronic exposures may adversely affect the central nervous system, but symptoms are more likely to occur after at least 1 or 2 years of prolonged or repeated exposures. Early symptoms may include weakness, in lower extremities, sleepiness, salivation, nervousness, and apathy. In more advanced stages, severe muscular incoordination, impaired speech, spastic walking, mask-like facial expression and uncontrollable laughter may occur. Manganese fumes have also been reported to result in metal fume fever, a flu-like syndrome with symptoms such as dizziness, chills, fever, headache, and nausea. An increased incidence of pneumonia, bronchitis, and pneumonitis has been reported in some workers' populations exposed to manganese. Animal studies indicate that manganese exposure may increase susceptibility to bacterial and viral infections.

Steel Bundles, detinned

MATERIAL SAFETY DATA SHEET

Vulcan Materials

Division of Vulcan Materials Company / P.O. Box 7588 • Birmingham, AL 35253-0588

I – IDENTIFICATION

CHEMICAL NAME	CHEMICAL FORMULA	MOLECULAR WEIGHT
Carbon Steel Scrap	Not Applicable	Not Applicable

TRADE NAME: Detinned Steel Bundles

SYNONYMS: Detinned Scrap Steel, Detinned Steel Billets

DOT IDENTIFICATION NO.: Not Classified

II – PRODUCT AND COMPONENT DATA

COMPONENT(S) CHEMICAL NAME	CAS REGISTRY NO.	% (Approx)	ACGIH TLV-TWA
Iron (Fe)	1309-37-1	>96	5.0mg/M³(fume)
Manganese (Mn)	7439-96-5	< 2	1.0mg/M³(fume)
Carbon (C)	1333-86-4	< 2	3.5mg/M³(dust) (carbon black)
Detinning Solution Residue	———	Trace	———

III – PHYSICAL DATA

APPEARANCE AND ODOR	SPECIFIC GRAVITY
Compacted blocks of scrap carbon steel No odor	7.84 @ 60°F
BOILING POINT	**VAPOR DENSITY IN AIR (Air = 1)**
(of iron dust): 3000°C Melting Point: 1371-1482°C	Not Applicable
VAPOR PRESSURE	**% VOLATILE, BY VOLUME**
(of iron dust) = 1 mm Hg @ 1787°C	Undetermined
EVAPORATION RATE	**SOLUBILITY IN WATER**
Not Applicable	Insoluble

IV – REACTIVITY DATA

STABILITY	CONDITIONS TO AVOID
Stable	Detinned steel scrap is non-reactive; however, scrap steel should be free of moisture before it comes into contact with molten metal.

INCOMPATIBILITY (Materials to avoid)

Acids, bases and oxidizers. Molten scrap metal can react violently with moisture causing splattering and/or explosions.

HAZARDOUS DECOMPOSITION PRODUCTS

Detinned steel scrap does not decompose; however, oxide fumes of the components may evolve upon melting.

HAZARDOUS POLYMERIZATION

Will not occur

C01398

V – FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS IN AIR
Non-Flammable	Non-Flammable

EXTINGUISHING AGENTS

Non-Flammable

USUAL FIRE AND EXPLOSION HAZARDS

Avoid using water or other liquids in fighting fires around molten metal. Dry chemicals or sand should be used to fight fires near molten metal (See Section IV).

VI – TOXICITY AND FIRST AID

EXPOSURE LIMITS (When exposure to this product and other chemicals is concurrent, the TLV must be defined in the workplace.)

ACGIH 8 hour TWA-TLV - See Section II
ACGIH Ceiling Limit: Manganese Dusts - 5.0 mg/M³
OSHA 8 hour PEL: Iron oxide fumes -10.0 mg/M³
OSHA 8 hour PEL: Carbon black - 3.5 mg/M³
OSHA Ceiling Limit: Manganese - 5.0 mg/M³

Effects described in this section are believed not to occur if exposures are maintained at or below appropriate TLVs.
Because of the wide variation in individual susceptibility, TLVs may not be applicable to all persons and those with medical conditions listed below.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE

Inhaling respirable dusts or fumes may aggravate existing respiratory system disease(s) and/or dysfunctions. Exposure to dusts may aggravate existing skin and eye conditions.

ACUTE TOXICITY Primary route(s) of exposure: ☒ Inhalation ☐ Skin Absorption ☐ Ingestion

In the non-molten state, acute toxicity is limited to inhalation of dusts which can cause irritation of the nose, throat and respiratory tract. Due to the possible presence of trace amounts of detinning solution residue (caustic) on the scrap, contact with the solid material or dusts may cause skin, eye and mucous membrane irritation.

In melting or thermal cutting of scrap, fumes of iron and manganese can cause irritation to the eyes, nose, throat and respiratory system. High levels of exposure may result in a metallic or sweet taste in the mouth with dryness and coughing at the time of overexposure.

Fumes of manganese can result in a transient feeling of illness called metal fume fever. Symptoms of metal fume fever are similar to the common cold or flu - including fever, muscle weakness and aches, headaches, nausea, chills, dry throat and cough. Symptoms usually start several hours after exposure and the fever may last 6 to 24 hours.

FIRST AID

Inhalation: Remove to fresh air. If difficulty in breathing occurs, administer oxygen and obtain medical attention. If breathing stops, give artificial respiration and obtain medical attention immediately.

Eye & Skin Contact: If metal dust or fumes come in contact with eyes, flush eyes immediately with running water and obtain medical attention if irritation persists. If skin becomes irritated, wash with soap and water. If irritation persists, obtain medical attention.

If molten metal comes in contact with skin or eyes, thermal burns will occur. Standard emergency first aid for thermal burns must be applied. Obtain medical attention immediately.

CHRONIC TOXICITY

There are no chronic toxicity studies available on detinned steel scrap in the solid state.

Chronic overexposure to iron oxide dusts or fumes has resulted in a benign pneumoconiosis (lung abnormality caused by dust or fumes) called siderosis. This condition has not been found to cause fibrosis or decreased pulmonary function. Siderosis has not been associated with illness or decreased life expectancy.

Chronic overexposure of manganese dust or fumes by inhalation primarily affects the central nervous system. Manganese fume has caused a nervous system disease similar to Parkinson's after six months to two years of overexposure. Initially, there is headache, restlessness, irritability and a tendency to either cry or laugh inappropriately. This is followed by an intermediate phase with visual hallucinations, double vision, impared hearing, uncontrollable impulses, mental confusion and euphoria. In the advanced phase the individual exhibits possible anemia, excessive salivation, disorders of the basal ganglia of Parkinson type, such as mask-like faces, muscle weakness, muscle rigidity, tremor of the arms and head and difficulty in walking or keeping balance. The respiratory system may also be affected by a condition known as "manganese pneumonia" which has symptoms parallel to pneumonia.

Iron, manganese and carbon are not listed as carcinogens on the NTP, IARC or OSHA lists of carcinogens.

VII – PERSONAL PROTECTION AND CONTROLS

RESPIRATORY PROTECTION

No respirators are required when product is in a solid state and dusts are below applicable TLVs. Use NIOSH-MSHA approved fume or dust respirators for conditions where fumes or dust exceed or are likely to exceed applicable TLVs. Respirator use must comply with all provisions of applicable respirator standards and regulations.

VENTILATION

Use local or general ventilation to maintain exposures below applicable exposure limits.

SKIN PROTECTION

Avoid contact of metal with skin - wear protective gloves. For molten scrap, heat and flame resistant gloves and clothing should be worn. In handling molten metal, the use of aluminized jackets, aprons, chaps and sleeves are required.

EYE PROTECTION

Safety glasses with side shields should be worn as minimum protection. When excessive dusty conditions exist wear goggles. Face shields must be worn when working with molten metal.

HYGIENE

Wash dust-exposed skin with soap and water. Do not eat, drink or smoke when working with metal. Washing clothes after each use is recommended.

OTHER CONTROL MEASURES

Exposure monitoring should be performed regularly to determine levels of exposure and appropriate control measures to be taken. Exposure levels in excess of applicable limits should be reduced by all feasible engineering controls.

VIII – STORAGE AND HANDLING PRECAUTIONS

When handling detinned steel scrap, use protective equipment as recommended in Section VII.

Prior to introducing scrap steel into molten metal, insure that the scrap is free from moisture. Moist materials introduced into molten metal can cause violent splattering and/or explosions.

IX – SPILL LEAK AND DISPOSAL PRACTICES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

If large quantities of dust are spilled, remove by vacuuming or wet sweeping to prevent heavy concentrations of airborne dust. Clean-up personnel should follow protective equipment recommendations given in Section VII.

WASTE DISPOSAL METHOD

Scrap metal can be reclaimed for reuse. Follow Federal, State and local laws and regulations regarding disposal.

X – TRANSPORTATION

DOT HAZARD CLASSIFICATION

Not Regulated

PLACARD REQUIRED

None

LABEL REQUIRED

None

For Further Information

Contact Vulcan Metals Division
Order Center
P. O. Box 7588
Birmingham, AL 35253-0588
800/633-8908
8 AM - 5 PM Central Time
Monday Through Friday
For Emergency Call CHEMTREC 800/424-9300

DATE OF PREPARATION: October 30, 1985

Tool Steel

NATIONAL FORGE COMPANY - IRVINE. PENNSYLVANIA 16329

MATERIAL SAFETY DATA SHEET

SECTION I

DATE 11/25/85

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
National Forge Company	814/563-7522
ADDRESS (NUMBER, STREET, CITY, & ZIP CODE) Irvine, Warren County, PA 16329	
PRODUCT NAME Tool Steel	CHEMICAL FAMILY Steel
GRADES	

SECTION II CHEMICAL COMPONENTS

	C A S NUMBER	RANGE %	ACGIH TLV (UNITS)	OSHA PEL
Iron (Fe)	7439-89-6	Balance	5 mg/m^3	10 mg/m^3
Chromium (Cr)	7740-47-3	.01-13.00	.05 mg/m^3	0.1 mg/m^3
Molybdenum (Mo)	7439-98-7	.01-2.60	5 mg/m^3	5 mg/m^3
Vanadium (V)	7440-62-2	.10-1.20	.05 mg/m^3	0.1 mg/m^3
Nickel (Ni)	7440-02-0	.01-9.25	1.0 mg/m^3	1.0 mg/m^3
Manganese (Mn)	7439-96-5	.20-1.40	1.0 mg/m^3	5 mg/m^3
Carbon (C)	7440-44-0	.01-1.60	N/A	N/A
Silicon (Si)	7740-21-3	.15-2.20	10 mg/m^3	15 mg/m^3
Aluminum (Al)	7429-90-5	.85-2.20	5 mg/m^3	N/A
Copper (Cu)	7440-50-8	.01-1.0	0.2 mg/m^3	0.1 mg/m^3
Tungsten (Tu)	7440-33-7	.40-1.75	5.0 mg/m^3	N/A
Trace Elements	N/A	Lt. 1.0	N/A	N/A

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	N/A	SPECIFIC GRAVITY (H_2O=1)	7.6-7.8
VAPOR PRESSURE (MM HG.)	N/A	PERCENT VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=1)	N/A	EVAPORATION RATE (=1)	N/A
SOLUBILITY IN WATER	N/A	MELTING POINT	2800°F
APPEARANCE & ODOR	Metallic Gray in Color & Odorless		

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (METHOD USED) N/A	FLAMMABLE LIMITS N/A	LEL	UEL
EXTINGUISHING MEDIA N/A			
SPECIAL FIRE FIGHTING PROCEDURES None			
UNUSUAL FIRE EXPLOSION HAZARDS None			

N/A = NOT APPLICABLE
UN = UNKNOWN

C01399

SECTION V - HEALTH HAZARD DATA

(X) MAJOR EXPOSURE HAZARD:	INHALATION [X]	SKIN CONTACT [ ]	SKIN ABSORPTION [ ]	INGESTION [ ]

NOTE: STEEL PRODUCTS IN THE NATURAL STATE DO NOT PRESENT AN INHALATION, INJECTION, OR CONTACT HAZARD HOWEVER.

OPERATIONS SUCH AS BURNING, WELDING, SAWING, BRAZING, OR GRINDING MAY RESULT IN THE FOLLOWING EFFECTS IF EXPOSURES EXCEED PERMISSIBLE LIMITS: (exposures to fume and dust)

. Could possibly aggravate chronic diseases or disorders of the respiratory system.

. The NTP and IARC consider chromium and certain chromium compounds to be known human "CARCINOGENS" and nickel and certain nickel compounds to be possible/probable human carcinogens.

. Maintaining iron oxide fumes and dust below its TLV should be sufficient to control the airborne concentrations of the other constituents.

. Welding, burning, etc., of steel in these products may produce fumes containing manganese, silicon, aluminum, and copper; air concentrations generated are expected to be very low.

FIRST AID AND MEDICAL EMERGENCY PROCEDURES: Eye and skin contact should not pose a significant health hazard. Inhalation: Remove from the exposed area unless proper respiratory protection is worn. Ingestion is not considered a health hazard. Always utilize good hygiene procedures before eating and leaving the work environment.

SECTION VI - REACTIVITY DATA

STABLE [X]	UNSTABLE [ ]	CONDITIONS TO AVOID: N/A

INCOMPATIBILITY (MATERIALS TO AVOID): Acids

DECOMPOSITION PRODUCTS: Welding and burning on this product may cause the generation of a variety of noxious fumes and gases (examples: chrome fume and carbon monoxide).

HAZARDOUS POLYMERIZATION	MAY OCCUR [ ]	CONDITIONS TO AVOID
	WILL NOT OCCUR [X]	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED/PRECAUTIONS WHILE HANDLING/STORING: N/A

WASTE DISPOSAL METHOD: All excess products can be disposed of or recycled for further use. They can be disposed of in a permitted hazardous waste landfill or disposed of by other methods which are in accordance with state, local, and/or federal regulations.

SECTION VIII - PERSONNEL PROTECTION INFORMATION

RESPIRATORY PROTECTION: Ventilation should be sufficient to maintain exposure levels below the applicable exposure limit. Eye and skin irritation is not anticipated to pose a significant health hazard. When controls of exposure are not sufficient to lower exposure to proper PEL, utilize a NIOSH-approved respirator for dust and fumes of metals within the use limits of the respirator.

GLOVES: Utilize as needed/dependent on personal job operations.

EYE PROTECTION: Wear eye protection when burning, grinding or welding of this product.

PREPARED BY

Thomas F. Fitzgerald
Safety Supervisor

Health Hazard Data

Tool Steel

Health Effects/Signs and Symptoms:

Note: Despite the fact that steel products in their natural physical form do not pose any health hazard, it is possible that fumes generated from burning, cutting, grinding, etc., may produce air concentrations higher than the permissible exposure limits for humans. Particular attention should be directed to all listed elements and the hazards they could present. The following is a list of fumes or dusts that may be generated from our steel products and the health hazards associated with chronic overexposure to them.

Nickel (Ni)

Nickel fumes and dusts are respiratory irritants and may cause a severe pneumonitis. Skin contact with nickel and its compounds may cause an allergic dermatitis. The resulting skin rash is often referred to as "nickel itch." Nickel and its compounds may produce eye irritation, particularly on the inner surfaces of the eyelids. Animal and/or epidemiology studies have linked nickel and certain nickel compounds to an increased incidence of cancer of the lungs and nasal passages.

Chromium (Cr)

The toxicity and health hazards of chromium are heavily dependent upon its oxidation state. The elemental, divalent, and trivalent forms are very low in toxicity. The hexavalent form (examples: chromatis and chromic acid) is very toxic and can produce both acute and chronic effects. Adverse effects on the skin may include ulcerations, irritative dermatitis, and allergic skin reactions. Adverse affects on the respiratory system may include bronchospasm, edema, hypersecretion, bronchitis, irritation, allergic asthmatic reactions, and ulceration and perforation of the nasal septum. Respiratory symptoms may include coughing and wheezing, shortness of breath, and nasal itch. Eye irritation or inflammation can also be produced. Exposures to some hexavalent chromium compounds have also been shown to be associated with an increased risk of lung cancer.

Iron (Fe)

Subjecting iron and alloys containing iron to high temperature (example: welding) will cause the formation of iron oxides. Long-term exposure to iron oxide fumes or dusts has been associated with a benign lung condition known as siderosis which is observable as an X-ray change. No physical impairment of lung function has been linked to siderosis.

Manganese (Mn)

Manganese intoxication is usually due to the oxide or salts of manganese, elemental manganese exhibits very low toxicity. The dusts and fumes can act as minor irritants to the eyes and respiratory tract. Both acute and chronic exposures may adversely affect the central nervous system, but symptoms are more likely to occur after at least 1 or 2 years of prolonged or repeated exposures. Early symptoms may include weakness, in lower extremities, sleepiness, salivation, nervousness, and apathy. In more advanced stages, severe muscular incoordination, impaired speech, spastic walking, mask-like facial expression and uncontrollable laughter may occur. Manganese fumes have also been reported to result in metal fume fever, a flu-like syndrome with symptoms such as dizziness, chills, fever, headache, and nausea. An increased incidence of pneumonia, bronchitis, and pneumonitis has been reported in some workers' populations exposed to manganese. Animal studies indicate that manganese exposure may increase susceptibility to bacterial and viral infections.

Silicon (Si)

This is considered to be a nuisance particulate by ACGIH.

Molybdenum (Mo)

Molybdenum and its compounds generally exhibit a low order of toxicity; however, soluble compounds (such as molybdenum trioxide) are considerably more toxic. Molybdenum trioxide may produce irritation of the eyes, nose, and throat. In animals, soluble molybdenum compounds have also caused weight loss, diarrhea, loss of coordination, pneumoconiosis (accumulation of particles in the lungs), breathing difficulties, anemia, and colic. Animal data also suggests that repeated exposure might be associated with gout. Pneumoconiosis with X-ray findings and subjective symptoms has been observed in a small number of workers exposed to metallic molybdenum and molybdenum trioxide; however, no physical impairment of lung function has been linked to this condition.

Copper (Cu)

Inhalation of copper fumes may cause irritation of the eyes, nose, and throat and a flu-like illness called metal fume fever. Signs and symptoms of metal fume fever include fever, muscle aches, nausea, chills, dry throat, cough, and weakness. Copper fumes may also produce a metallic or sweet taste. Repeated or prolonged exposure to copper fumes may cause discoloration of the skin and hair.

Vanadium (V)

Vanadium compounds (especially vanadium pentoride) are irritants to the eyes, respiratory tract, and, to a less frequent extent, the skin. Eye symptoms may include excessive tearing and a burning sensation. Skin rashes (which may be allergic in nature) resemble eczema and may itch intensely. Excessive inhalation exposures even after brief periods may result in inflammation of the nasal passages, sore throat, cough, tracheitis, bronchitis, wheezing, and chest pains. Long-term exposure may result in more severe effects such as pulmonary edema, chronic bronchitis, and recurring episodes of labored breathing. Workers exposed to excessive levels of vanadium often show a greenish discoloration of the tongue.

Aluminum (Al)

Particles of aluminum deposited in the eye may cause irreversible tissue damage of the cornea. Aluminum salts may cause dermatitis, eczema, conjunctivitis, and irritation of the mucous membranes of the upper respiratory tract. Long-term inhalation exposure to aluminum dusts or fumes has been associated with a fibrotic lung condition known as Shaver's disease; however, the evidence for this is not conclusive since affected workers were exposed to other substances (such as silica) as well. Symptoms of this condition may include shortness of breath, cough, and fatigue.

Petroleum Hydrocarbon

MATERIAL SAFETY DATA SHEET

UGL 80W-90

I. MATERIAL IDENTIFICATION

Name: UGL 80W-90 & 85W-140
Conoco Product Code: 9019/9024
Synonyms: Petroleum Lubricanting Oil
Chemical Family: Petroleum Hydrocarbon
Manufacturer: Conoco Inc.
Address: P.O. Box 1267, Ponca City, OK 74603

CAS Registry No.: Mixture
Transportation Emergency No.:
(800) 424-9300 (Chemtrec)
Product Information No.:
(405) 767-6000

II. HAZARDOUS INGREDIENTS — HAZARD DATA

Hazard Determination:
Health Effect Properties: None. — Not applicable.

Physical Effect Properties:
Product/Mixture: None. — Not applicable.

III. PHYSICAL DATA

Appearance and Odor: Dark brown liquid; mild petroleum hydrocarbon odor.

Boiling Point (Deg.F)	750-1200	Specific Gravity (H_2O=1)	0.89
Vapor Pressure (mmHg)	Nil	% Volatile (by volume)	Nil
Vapor Density (Air=1)	Not Applicable	Evaporation Rate (=1)	Nil
Solubility in Water	Insoluble		

IV. REACTIVITY DATA — Stable: X — Unstable:

Hazardous Decomposition Products: Normal combustion forms carbon dioxide; incomplete combustion may produce carbon monoxide.

Conditions To Avoid: Strong oxidizing materials, heat, flame.

Hazardous Polymerization: Will not occur.

August 9, 1985

CAS Registry No.: Mixture

V. FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method used): 330F (PMCC) Autoignition Temperature: 750F
Handle and store in accordance with NFPA procedure for Class III B Combustible Liquid.

Extinguishing Media: Use water spray, dry chemical, foam, or carbon dioxide.

Special Fire Fighting Procedures: Water or foam may cause frothing. Use water to keep fire-exposed containers cool. Water spray may be used to flush spills away from exposures.

Unusual Fire and Explosion Hazards: Products of combustion may contain carbon monoxide, carbon dioxide, and other toxic materials. Do not enter enclosed or confined space without proper protective equipment including respiratory protection.

National Fire Protection Agency (NFPA) CLASSIFICATION			HAZARD RATING		
Health 0	Fire 1	Reactivity 0	Least - 0	Slight - 1	Moderate - 2
			High - 3	Extreme - 4	

VI. TRANSPORTATION AND STORAGE — DOT HAZARD CLASS: Not Applicable

Precautions To Be Taken In Handling And Storing: Product is Class III B Combustible Liquid per NFPA Code No. 30-1984. Store and handle accordingly.

Shipping Paper Description: Not D.O.T. Regulated.

Placard: Not D.O.T. Regulated.

Label: Not D.O.T. Regulated.

VII. HEALTH HAZARD INFORMATION

PEL Not Established TLV Not Established
Ceiling Value Not Established AEL Not Established

Primary Route of Exposure/Entry: Skin.

Signs and Symptoms of Exposure/Medical Conditions Aggravated By Exposure:
No adverse health effect has been identified specifically for this product. Health effect information from animal and human studies has been included on related materials, even though health experts may disagree as to the significance of this data.

Mouse skin painting studies have shown that highly solvent-refined petroleum distillates having a boiling point below 700F, and which are similar to ingredients in this product, have not caused skin tumors. Studies of petroleum workers have not shown a significant increased incidence of skin tumors.

CAS Registry No.: Mixture

VII. HEALTH HAZARD INFORMATION (continued)

The product may cause irritation to eyes, lungs, or skin after prolonged or repeated exposure.

Listed as Carcinogen or Potential Carcinogen by: NTP No IARC No OSHA No

VIII. EMERGENCY AND FIRST AID PROCEDURES

Eyes: Immediately wash with fresh water for at least 15 minutes and get medical attention.

Skin: Wash exposed skin thoroughly with soap and water. If irritation persists, consult a physician.

Inhalation: If overexposure occurs, remove individual to fresh air. If breathing stops, administer artificial respiration.

Ingestion: If this material is swallowed, do not induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Immediately consult a physician. Do not attempt to give liquid to an unconscious person.

Note to Physicians: Gastric lavage by qualified medical personnel may be considered, depending on quantity of material ingested.

IX. SPILL, LEAK AND DISPOSAL PROCEDURES

RCRA HAZARDOUS WASTE: Yes____ No X

In Case Of Spill Or Leak: Contain spill immediately in smallest area possible. Recover as much of the product itself as possible by such methods as vacuuming, followed by soaking up residual fluids by use of absorbent materials. Remove contaminated items including solids and place in proper container for disposal. Avoid washing, draining or directing material to storm or sanitary sewers.

Waste Disposal Method: Recycle as much of the recoverable product as possible. Dispose of nonrecyclable material by such methods as controlled incineration, complying with federal, state and local regulations.

Unleaded Gasoline

conoco MATERIAL SAFETY DATA SHEET

I. MATERIAL IDENTIFICATION

Name: Unleaded Gasoline
Conoco Product Code: 1410/1411
Synonyms: Automotive Unleaded Gasoline
Chemical Family: Mixed Petroleum Hydrocarbons
Manufacturer: Conoco Inc.
Address: P. O. Box 1267, Ponca City, OK 74603

CAS Reg. No.: Mixture
Transportation Emergency No.:
(800) 424-9300 (Chemtrec)
Product Information No.:
(405) 767-6000

II. HAZARDOUS INGREDIENTS — HAZARD DATA

Hazard Determination:

Health Effect Properties:

Hydrocarbons (Aromatic and paraffinic hydrocarbons)	Potential to cause kidney toxicity and tumors of the liver, skin and kidney in laboratory animals.
Benzene (71-43-2)	A few studies have indicated that workers exposed many years to high concentrations of benzene have a slightly higher incidence of leukemia.

Physical Effect Properties:

Product/Mixture:	Class I A Flammable Liquid per NFPA Code No. 30-1984.

III. PHYSICAL DATA

Appearance and Odor: Water white to straw yellow liquid; gasoline odor.

Boiling Range (Deg.F)	85-437	Specific Gravity (H_2O=1)	0.70-0.77
Vapor Pressure (mmHg) at 68F	275-475	% Volatile (by volume)	100
Solubility in Water	Insoluble		

IV. REACTIVITY DATA — Stable: X — Unstable:

Hazardous Decomposition Products: Carbon monoxide may be formed from incomplete combustion.

Condition to Avoid: Oxidizing materials, heat, flame.

Hazardous Polymerization: Will not occur.

V. FIRE AND EXPLOSION HAZARD DATA — LFL: 1.3 — UFL: 7.6

Flash Point (Method used): As low as -50F (TCC)
Handle and store in accordance with NFPA procedure for Class I A Flammable Liquid.

Extinguishing Media: Use dry chemical, foam, or carbon dioxide.

January 17, 1985/GASC0140

V. FIRE AND EXPLOSION HAZARD DATA (continued)

Special Fire Fighting Procedures: Water may be ineffective to extinguish, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Water spray may be used to flush spills away from exposure.

Unusual Fire and Explosion Hazards: Highly flammable. Products of combustion may contain carbon monoxide, carbon dioxide, and other toxic materials. Do not enter enclosed or confined space without proper protective equipment including respiratory protection.

National Fire Protection Agency (NFPA)

Health 1 Fire 3 Reactivity 0

HAZARD RATING

Least - 0 Slight - 1 Moderate - 2 High - 3 Extreme - 4

VI. TRANSPORTATION AND STORAGE

DOT HAZARD CLASS: Flammable liquid

Precautions To Be Taken In Handling And Storing: Product is Class I A Flammable Liquid per NFPA Code No. 30-1984. Store and handle accordingly.

Shipping Paper Description: Gasoline, flammable liquid, UN 1203.

Placard: Flammable.

D.O.T. Label: Flammable liquid.

OSHA Label: CAUTION: Minimize exposure. This product contains benzene and certain other hydrocarbons which are potentially toxic or carcinogenic.

If ingested, do not induce vomiting. Call a physician immediately.
Wash thoroughly with soap and water after contact.

Flammable Liquid.

VII. HEALTH HAZARD INFORMATION

PEL Not Established TLV 300 ppm "Gasoline"
Ceiling Value Not Established AEL Not Established

Primary Routes of Exposure/Entry: Inhalation, skin.

VII. HEALTH HAZARD INFORMATION (continued)

Signs and Symptoms of Exposure/Medical Conditions Aggravated by Exposure:
Studies with rodents have shown that petroleum distillates have caused kidney damage and kidney or liver tumors. However, the kidney effects were not seen in similar studies involving guinea pigs, dogs, or monkeys. Several studies evaluating petroleum workers have not shown significant increases of kidney damage nor kidney or liver tumors.

Mouse skin painting studies have shown that unrefined petroleum distillates having a boiling point of 120-700F, and which are similar to ingredients in this product, caused a low incidence of skin tumors.

The product may cause irritation to eyes, lungs, or skin after prolonged or repeated exposure. Overexposure may cause central nervous system depression.

Data from animal studies with generic unleaded gasoline, funded by the American Petroleum Institute:

Median lethal dose, rat oral: 18.8 ml/kg
Skin toxicity, rabbits: No mortality at dose of 5 ml/kg
Slight irritation to skin.
Eye irritation, rabbits: Non-irritating
Genotoxic studies: Negative
Reproductive toxicity: No abnormalities in newborn rats.

Listed as Carcinogen or Potential Carcinogen by: NTP No IARC No OSHA No

VIII. EMERGENCY AND FIRST AID PROCEDURES

Eyes: Immediately wash with fresh water for at least 15 minutes and get medical attention.

Skin: Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation persists, consult a physician.

Launder contaminated clothing before reuse. Extremely contaminated leather shoes should be discarded.

Inhalation: If overexposure occurs, remove individual to fresh air. If breathing stops, administer artificial respiration.

Ingestion: If this material is swallowed, do not induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Immediately consult a physician. Do not attempt to give liquid to an unconscious person.

Note to Physicians: Gastric lavage by qualified medical personnel may be considered, depending on quantity of material ingested.

IX. SPILL, LEAK AND DISPOSAL PROCEDURES

RCRA HAZARDOUS WASTE: Yes X No____

In Case of Spill or Leak: Contain spill immediately in smallest area possible. Recover as much of the product itself as possible by such methods as vacuuming, followed by soaking up of residual fluids by use of absorbent materials. Remove contaminated items including contaminated soil and place in proper containers for disposal. Avoid washing, draining or directing material to storm or sanitary sewers.

Waste Disposal Method: Recycle as much of the recoverable product as possible. Dispose of nonrecyclable material as a RCRA hazardous waste by such methods as incineration, complying with federal, state and local regulations.

X. PRECAUTIONARY MEASURES

Respiratory Protection: Use air mask or hydrocarbon absorbing respirator.

Ventilation: Use adequate ventilation to meet recommended concentrations. Avoid sparking and explosive mixtures.

Protective Gloves: Impervious as needed to avoid skin contact.

Eye Protection: Goggles or face shield for sprays/mists or if splashing is probable.

Other Protective Equipment: Protective clothing should be worn. Soiled clothing should be removed and laundered.

Super Unleaded Gasoline

conoco

MATERIAL SAFETY DATA SHEET

I. MATERIAL IDENTIFICATION

Name: Super Unleaded Gasoline/Premium Unleaded Gasoline
Conoco Product Code: 1420/1200
Synonyms: Automotive Unleaded Gasoline
Chemical Family: Mixed Petroleum Hydrocarbons
Manufacturer: Conoco Inc.
Address: P. O. Box 1267, Ponca City, OK 74603

CAS Reg. No.: Mixture
Transportation Emergency No.:
(800) 424-9300 (Chemtrec)
Product Information No.:
(405) 767-6000

II. HAZARDOUS INGREDIENTS — HAZARD DATA

Hazard Determination:

Health Effect Properties:

Hydrocarbons (Aromatic and paraffinic hydrocarbons)	Potential to cause kidney toxicity and tumors of the liver, skin, and kidney in laboratory animals.
Benzene (71-43-2)	A few studies have indicated that workers exposed many years to high concentrations of benzene have a slightly higher incidence of leukemia. Benzene can also be toxic to blood elements and bone marrow.

Physical Effect Properties:

Product/Mixture:	Class I A Flammable Liquid per NFPA Code No. 30-1984.

III. PHYSICAL DATA

Appearance and Odor: Red liquid; gasoline odor.

Boiling Range (Deg.F)	85-437	Specific Gravity (H_2O=1)	70-0.77
Vapor Pressure (mmHg) at 68F	275-475	% Volatile (by volume)	100
Solubility in Water	Insoluble		

IV. REACTIVITY DATA — Stable: X — Unstable:

Hazardous Decomposition Products: Carbon monoxide may be formed from incomplete combustion.

Conditions to Avoid: Oxidizing materials, heat, flame.

Hazardous Polymerization: Will not occur.

V. FIRE AND EXPLOSION HAZARD DATA — LFL: 1.3 — UFL: 6.0

Flash Point (Method used): As low as -50F (TCC)
Handle and store in accordance with NFPA procedure for Class I A Flammable Liquid.

Extinguishing Media: Use dry chemical, foam, or carbon dioxide.

V. FIRE AND EXPLOSION HAZARD DATA (continued)

Special Fire Fighting Procedures: Water may be ineffective to extinguish, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Water spray may be used to flush spills away from exposure.

Unusual Fire and Explosion Hazards: Highly flammable. Products of combustion may contain carbon monoxide, carbon dioxide and other toxic materials. Do not enter enclosed or confined space without proper protective equipment including respiratory protection.

National Fire Protection Agency (NFPA) CLASSIFICATION			HAZARD RATING		
Health 1	Fire 3	Reactivity 0	Least - 0	Slight - 1	Moderate - 2
				High - 3	Extreme - 4

VI. TRANSPORTATION AND STORAGE — DOT HAZARD CLASS: Flammable liquid

Precautions To Be Taken In Handling And Storing: Product is Class I A Flammable Liquid per NFPA Code No. 30-1984. Store and handle accordingly.

Shipping Paper Description: Gasoline, flammable liquid, UN 1203.

Placard: Flammable.

D.O.T. Label: Flammable liquid.

OSHA Label: CAUTION: Minimize exposure. This product contains benzene and certain other hydrocarbons which are potentially toxic or carcinogenic.

If ingested, do not induce vomiting. Call a physician immediately.
Wash thoroughly with soap and water after contact.

Flammable Liquid.

VII. HEALTH HAZARD INFORMATION

PEL Not Established TLV 300 ppm
Ceiling Value Not Established AEL Not Established

Primary Routes of Exposure/Entry: Inhalation, skin.

Signs and Symptoms of Exposure/Medical Conditions Aggravated by Exposure: Studies with rodents have shown that petroleum distillates have caused kidney damage and kidney or liver tumors. However, the kidney effects were not seen in similar studies involving guinea pigs, dogs, or monkeys. Several studies evaluating petroleum workers have not shown significant increases of kidney damage nor kidney or liver tumors.

VII. HEALTH HAZARD INFORMATION (continued)

Mouse skin painting studies have shown that unrefined petroleum distillates having a boiling point of 120-700F, and which are similar to ingredients in this product, caused a low incidence of skin tumors. The relative significance of this to human health is uncertain since the petroleum distillates were not washed from the treatment site and the resulting skin irritation may play a role in the tumorigenic response.

The product may cause irritation to eyes, lungs, or skin after prolonged or repeated exposure. Overexposure may cause central nervous system depression.

Data from animal studies with a generic unleaded gasoline, funded by the American Petroleum Institute:

Median lethal dose, rat oral: 18.8 ml/kg
Skin toxicity, rabbits: No mortality at dose of 5 ml/kg
Slight irritation to skin.
Eye irritation, rabbits: Non-irritating
Genotoxic studies: Negative
Reproductive toxicity: No abnormalities in newborn rats.

Listed as Carcinogen or Potential Carcinogen by: NTP No IARC No OSHA No

VIII. EMERGENCY AND FIRST AID PROCEDURES

Eyes: Immediately wash with fresh water for at least 15 minutes and get medical attention.

Skin: Remove contaminated clothing as soon as possible. Wash exposed skin thoroughly with soap and water. If irritation persists, consult a physician.

Launder contaminated clothing before reuse. Extremely contaminated leather shoes should be discarded.

Inhalation: If overexposure occurs, remove individual to fresh air. If breathing stops, administer artificial respiration.

Ingestion: If this material is swallowed, do not induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Immediately consult a physician. Do not attempt to give liquid to an unconscious person.

Note to Physicians: Gastric lavage by qualified medical personnel may be considered, depending on quantity of material ingested.

IX. SPILL, LEAK AND DISPOSAL PROCEDURES

RCRA HAZARDOUS WASTE: Yes X No____

In Case of Spill or Leak: Contain spill immediately in smallest area possible. Recover as much of the product itself as possible by such methods as vacuuming, followed by soaking up of residual fluids by use of absorbent materials. Remove contaminated items including contaminated soil and place in proper containers for disposal. Avoid washing, draining or directing material to storm or sanitary sewers.

Waste Disposal Method: Recycle as much of the recoverable product as possible. Dispose of nonrecyclable material as a RCRA hazardous waste by such methods as incineration, complying with federal, state and local regulations.

X. PRECAUTIONARY MEASURES

Respiratory Protection: Use air mask or hydrocarbon absorbing respirator.

Ventilation: Use adequate ventilation to meet recommended concentrations. Avoid sparking hazards and explosive mixtures.

Protective Gloves: Impervious as needed to avoid skin contact.

Eye Protection: Goggles or face shield for sprays/mists or if splashing is probable.

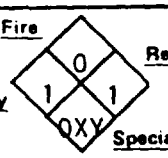
Other Protective Equipment: Protective clothing should be worn. Soiled clothing should be removed and laundered.

MOGUL
DIVISION OF THE DEXTER CORPORATION
Executive Offices
Chagrin Falls, Ohio 44022
(216) 247-5000

For sales offices or product literature, Call Toll Free: 800-321-1004
FOR MEDICAL EMERGENCY, CALL COLLECT (216) 835-7233

IN FIRE CONDITIONS:
NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT
* = CHRONIC
HEALTH HAZARD - SEE SECTION V



MATERIAL SAFETY DATA SHEET

SECTION I: PRODUCT IDENTIFICATION

016

TRADE NAME: ~~WS-123~~
CHEMICAL NAME: Polyphosphate - Dichromate Solution
CHEMICAL FAMILY: Industrial Water Treatment

SECTION II: HAZARDOUS INGREDIENTS

Material	CAS #	%	TLV	PEL
Sodium dichromate dihydrate	10588-01-9	20-30	0.05 mg/m^3	0.1 mg/m^3

SECTION III: PHYSICAL DATA

Boiling Point (F):	Like water	Specific Gravity:	1.24
Vapor Pressure (mm Hg):	Like water	Percent Volatile by Volume(%):	Approx.70
Vapor Density (air = 1):	Like water	Evap. Rate (water =1):	Like water
Solubility in Water:	Complete	pH:	5.2
Density:	Not applicable (N/A)	pH (1% soln):	--

Appearance and Odor: Orange liquid, mild odor

SECTION IV: FIRE PROTECTION INFORMATION

Flash Point (method used): NA
FLammable Limits: NA
Extinguishing Media: Water, CO_2, dry chemical, foam

Special Fire-Fighting Procedures: Keep drums, exposed to fire, cool with water.

Unusual Fire and Explosion Hazards: Contains dichromate, an oxidizer. In fire, if water is driven off, product may ignite or explode in presence of combustible materials.

National Fire Protection Association (NFPA) Rating (in fire conditions):
Toxicity: 1 Fire: 0 Reactivity: 1 Special: OXY

SECTION V: HEALTH HAZARD INFORMATION

Acute effects of exposure:

TOXIC ACIDIC MATERIAL!

Causes eye damage or irritation. Chromate can be absorbed through skin; massive overexposure to skin may result in kidney failure and death.

Inhalation of mists may cause severe irritation of the respiratory tract and nasal septum and possible perforation. Ingestion can cause severe tissue destruction; kidney failure and death.

Chronic effects of exposure:

Prolonged or repeated eye contact may cause conjunctivitis. Prolonged or repeated skin contact, especially with broken skin, may cause "chrome sores". Ulceration and perforation of the nasal septum may result from prolonged or repeated inhalation of sodium bichromatic mists and dusts.

Emergency and First Aid Procedures:

Skin: Flush with water, then wash thoroughly with soap and water.

Eyes: Flush with water for 15 minutes and get medical attention if an irritation persists.

Ingestion: Drink plenty of water, and call collect (216) 835-7233 or consult physician immediately. Avoid alcoholic beverages.

FOR 24 HOUR EMERGENCY MEDICAL INFORMATION CALL COLLECT (216) 835-7233 (TEL-SAFE).

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SECTION VI: REACTIVITY DATA

Stable: Yes

Hazardous Polymerization: No

Conditions to Avoid:

None known

Materials to Avoid:

Organic, combustible or oxidizable materials; strong acids.

Hazardous Decomposition Products:

Nitrogen oxides, carbon monoxide, carbon dioxide and/or hydrogen cyanide possible upon thermal decomposition.

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SECTION VII: SPILL OR LEAK PROCEDURES AND WASTE DISPOSAL

Spill or Leak Procedures:

Contain spill if without risk. Use inert absorbent material such as sand or clay to soak up and place in empty drums. Do not use sawdust or other combustible absorbent. To neutralize hexavalent chrome: reduce with sodium bisulfite, sodium sulfite, ferrous sulfite or ferrous chloride and then neutralize with sodium bicarbonate to pH 7.5 to make chromic oxide (trivalent). Never flush to sewer. Major spills should be reported according to EPA regulations.

Waste Disposal:

Qualifies as a RCRA hazardous waste due to pH and presence of chromium in excess of 5 mg/l. Dispose at authorized waste disposal facility in accordance with local, state and federal requirements.

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SECTION VIII: OCCUPATIONAL PROTECTIVE EQUIPMENT

Eye: Face shield, chemical goggles or chemical safety glasses with side shields should be worn.

Respiratory: Wear a NIOSH/MSHA-approved respirator for dusts, mists and vapors if exceed permissible exposure limits.

Ventilation: Good industrial hygiene practice dictates that the work area be isolated and provided with adequate local exhaust ventilation or other controls to maintain the air concentration of sodium dichromate below $0.5/mg/10m^3$ (8 hr. TWA) as required by OSHA. The number of persons exposed should be minimized. A NIOSH/MSHA-approved respirator for dusts and mists must be used, if the air concentration exceeds the PEL, until the exposures are controlled.

Skin: Industrial grade protective rubber or plastic gloves should be worn.

Other: Rubber boots and aprons and daily change of work clothes are recommended. Launder contaminated clothing before wearing.

SECTION IX: PRECAUTIONARY MEASURES

Avoid skin and eye contact. Do not take internally. Keep container closed when not in use. Wash thoroughly after handling. Do not return spilled material to original container; remove and dispose. Do not inhale mists or vapors.
Wash after handling, and before eating, drinking and smoking. Refer to "Mogul Material Safety Data sheet Glossary of Terms" for additional information.

SECTION X: SHIPPING INFORMATION

DOT Label(s):	NA
DOT Proper Shipping Name:	NA
DOT Hazard Class/I.D. No:	NA
U.S. Surface Freight Classification:	Compounds, Industrial Water Treating, Liquid
Hazard Substance(s)/Reportable Quantities:	Sodium dichromate/1,000 lbs.

SECTION XI: ADDITIONAL INFORMATION

FDA:	None
USDA:	None
EPA:	Ingredients reported to TSCA Inventory.
Aquatic Toxicity:	Not tested

Date: 8/85 **Supersedes** 1 / 84

For additional non-emergency information: **WS-123**

Director of Safety
Mogul Division
Chagrin Falls, OH 44022
(216) 247-5000

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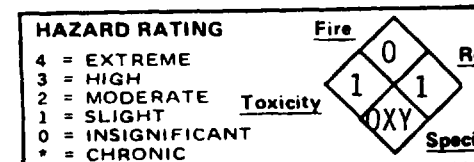
IN FIRE CONDITIONS:
NATIONAL FIRE PROTECTION ASSOCIATION
(NFPA)

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT
* = CHRONIC HEALTH HAZARD - SEE SECTION V



MATERIAL SAFETY DATA SHEET

SECTION I: PRODUCT IDENTIFICATION

027

TRADE NAME: WS-164
CHEMICAL NAME: Polymer/Phosphonate/Chromate Solution
CHEMICAL FAMILY: Industrial Water Treatment: Corrosion Inhibitor

SECTION II: HAZARDOUS INGREDIENTS

Material	CAS #	%	TLV (as Cr)	Other
Sodium dichromate dihydrate	10588-01-9	1-2	0.05 mg/m^3	--
Tolyltriazole (oral LD_{50} rat - 675 mg/kg)	29385-43-1	1-2	Not Estab.	--
Potassium hydroxide	1310-58-3	5-10	2 mg/m^{3}C	--

SECTION III: PHYSICAL DATA

Boiling Point (F):	Like water	Specific Gravity:	1.104
Vapor Pressure (mm Hg):	Like water	Percent Volatile by Volume (%):	75
Vapor Density (air = 1):	Like water	Evap. Rate (water =1):	Like water
Solubility in Water:	Complete	pH:	12-12.5
Density:	Not applicable (NA)	pH (1% soln):	--
Appearance and Odor:	Brown liquid		

SECTION IV: FIRE PROTECTION INFORMATION

Flash Point (method used): NA
FLammable Limits: NA
Extinguishing Media: Water, CO_2, dry chemical, foam

Special Fire-Fighting Procedures: Keep drums, exposed to fire, cool with water.

Unusual Fire and Explosion Hazards: Contains dichromate, an oxidizer. In fire, if water is driven off, product may ignite or explode in presence of combustible materials.

National Fire Protection Association (NFPA) Rating (in fire conditions):
Toxicity: 1 Fire: 0 Reactivity: 1 Special: OXY

SECTION V: HEALTH HAZARD INFORMATION

Acute effects of exposure:

TOXIC ALKALINE MATERIAL!

Causes eye damage or irritation. Chromate can be absorbed through skin; massive overexposure to skin may result in kidney failure and death.

Inhalation of mists may cause severe irritation of the respiratory tract and nasal septum and possible perforation. Ingestion can cause severe tissue destruction; kidney failure and death.

Chronic effects of exposure:

Prolonged or repeated eye contact may cause conjunctivitis. Prolonged or repeated skin contact, especially with broken skin, may cause "chrome sores". Ulceration and perforation of the nasal septum may result from prolonged or repeated inhalation of sodium bichromatic mists and dusts.

Emergency and First Aid Procedures:

Skin: Flush with water, then wash thoroughly with soap and water.

Eyes: Flush with water for 15 minutes and get medical attention if an irritation persists.

Ingestion: Drink plenty of water, and call collect (216) 835-7233 or consult physician immediately. Avoid alcoholic beverages.

FOR 24 HOUR EMERGENCY MEDICAL INFORMATION CALL COLLECT (216) 835-7233 (TEL-SAFE).

SECTION VI: REACTIVITY DATA

Stable: Yes

Hazardous Polymerization: No

Conditions to Avoid:

None known

Materials to Avoid:

Organic, combustible or oxidizable materials; strong acids.

Hazardous Decomposition Products:

Nitrogen oxides, carbon monoxide, carbon dioxide and/or hydrogen cyanide possible upon thermal decomposition.

SECTION VII: SPILL OR LEAK PROCEDURES

Spill or Leak Procedures:

Contain spill if without risk.

Waste Disposal:

Qualifies as a RCRA hazardous waste due to pH and presence of chromium in excess of 5 mg/ Dispose at authorized waste disposal facility in accordance with local, state and federal requirements.

SECTION VIII: OCCUPATIONAL PROTECTIVE EQUIPMENT

Eye: Chemical safety glasses or goggles.

Respiratory: Usually not required.

Skin: Rubber gloves.

Local Exhaust: Recommended.

Other: Rubber apron if splashing is likely.

SECTION IX: PRECAUTIONARY MEASURES

Avoid skin and eye contact. Do not take internally. Keep container closed when not in use. Wash thoroughly after handling. Do not return spilled material to original container; remove and dispose. Do not inhale vapors or mists.

Wash after handling, and before eating, drinking and smoking. Refer to "Mogul Material Safety and Data Sheet Glossry of Terms" for additional information.

SECTION X: SHIPPING INFORMATION

DOT Label(s):	NA
DOT Proper Shipping Name:	NA
DOT Hazard Class/I.D. No:	NA
U.S. Surface Freight Classification:	Compounds, Industrial Water Treating, Liquid
Hazard Substance(s)/Reportable Quantities:	Sodium dichromate/1,000 lbs.

SECTION XI: ADDITIONAL INFORMATION

FDS:	None
USDA:	Authorized for use in cooling water that does not contact food.
EPA:	Ingredients reported to TSCA Inventory.
Aquatiac Toxicity:	96 hr LC_{50} - Bluegill - 1,400 ppm

Date: 9/85

Supersedes 1 / 84

WS-164

Director of Safety
Mogul Division
Chagrin Falls, OH 44022
(216) 247-5000

Form Approved
Budget Bureau No. 44-R1167
Approval Expires April 30, 1972

Form No. OSHA-20
June 1971

U.S. DEPARTMENT OF LABOR

Occupational Safety & Health Adm.

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MATERIAL SAFETY DATA SHEET

Weld-on 715

SECTION I

MANUFACTURER'S NAME: Industrial Polychemical Service	EMERGENCY TELEPHONE NO.: 213-321-6515
ADDRESS (Number, Street, City, State, and ZIP Code): P. O. Box 471, Gardena, CAlif. 90247	
CHEMICAL NAME AND SYNONYMS: Solvent Cements for Polyvinylchloride	TRADE NAME AND SYNONYMS: Weld-On 715 (White & Gray)
CHEMICAL FAMILY: Ether & Ketone	FORMULA: NA
NA - Mixture of PVC resin & Organic Solvents	

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	Wt. %	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS: Inertfiller T102 and Carbon black	3		BASE METAL		
CATALYST: None			ALLOYS		
VEHICLE: PVC RESIN	Min. 10		METALLIC COATINGS		
SOLVENTS: SEE BELOW		200	FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES: None			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES		TLV	%	TLV (Units)
THF	)Major component	200 PPM Calculated for mixture		
Cyclohexanone)	Minor "	50 " 200 PPM		
MEK	)Very Minor	200 "		

SECTION III PHYSICAL DATA

BOILING POINT (°F.) Lowest boiling component (THF)	151°F	SPECIFIC GRAVITY (H_2O=1) Typical	0.945
VAPOR PRESSURE (mm Hg.) (") @ 25°C	190	PERCENT VOLATILE BY VOLUME (%) APPROX.	90%
VAPOR DENSITY (AIR=1)	2.49	EVAPORATION RATE (BUAC ____ =1)	5.0 to 8
SOLUBILITY IN WATER (Solvent Portion- PVC Resin -	∞ Precipitates		
APPEARANCE AND ODOR: Opaque white or gray, medium syrupy liquid, Ethereal odor.			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) (T.O.C) 8°F	FLAMMABLE LIMITS	Lel 2.0	Uel 11.8

EXTINGUISHING MEDIA
Dry chemical carbondioxide, foam - Ansul "Purple K" - National Aer-o-Foam

SPECIAL FIRE FIGHTING PROCEDURES
Close or confined quarters require self contained breathing apparatus. Positive pressure hose masks or airline masks.

UNUSUAL FIRE AND EXPLOSION HAZARDS
Fire hazard because of low flash point, high volatility and heavy vapor.

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SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: 200 PPM

EFFECTS OF OVEREXPOSURE: Severe overexposure may result in nausea, dizziness, headache, can cause narcosis, irritaion of eyes and nasal passages. Normal defatting effect of solvents on tissue

EMERGENCY AND FIRST AID PROCEDURES

Vapors: Remove to freshair

Liquid: Remove contaminated clothing & wash skin with water. Flush eyes with plenty of water for 15 minutes - call physician - if swallowed, induce vomiting - call physician.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID: Keep away from heat, sparks and open flame.
	STABLE X		

INCOMPATABILITY *(Materials to avoid)*: Caustics, ammonia, inorganic acids

HAZARDOUS DECOMPOSITION PRODUCTS: Chlorine gas and hydrochloric acid from polyvinylchloride carbon monoxide, CO_2

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID: Keep away from heat, sparks and flame.
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Eliminate all ignition sources - avoid breathing of vapors. Keep liquid out of eyes. Flush with large volume of water.

WASTE DISPOSAL METHOD: Incinerate - Excessive quantities should not be permitted to enter drains where there is danger of vapor becoming ignited.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*: None required with normal ventilation. Use respirator for organic vapors for confined areas. e.g. Mine Safety Appliance - respirator. Cat.No. 35556.

VENTILATION	LOCAL EXHAUST (Preferable) Provide normal ventilation	SPECIAL	-
	MECHANICAL *(General)* Low point - 6 air changes per hour	OTHER	-

PROTECTIVE GLOVES: Rubber or PVA gloves are suitable.

EYE PROTECTION: Chemical safety goggles.

OTHER PROTECTIVE EQUIPMENT: Impervious apron.

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: Keep away from heat, sparks and open flame. Avoid prolonged breathing of vapor.

Store between 40 and 110°F.

OTHER PRECAUTIONS

Form Approved
Budget Bureau No. 44-R1387
Approval Expires April 30, 1972

Form No. OSHA-20
June 1971

U.S. DEPARTMENT OF LABOR

Occupational Safety & Health Adm.

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MATERIAL SAFETY DATA SHEET

Weld-on 710

SECTION I

MANUFACTURER'S NAME: INDUSTRIAL POLYCHEMICAL SERVICE	EMERGENCY TELEPHONE NO.: 213-321-6515
ADDRESS (Number, Street, City, State, and ZIP Code): P. O. BOX 471, Gardena, California 90247	
CHEMICAL NAME AND SYNONYMS: SOLVENT CEMENTS FOR POLYVINYLCHLORIDE	TRADE NAME AND SYNONYMS: WELD-ON 710 PLASTIC PIPE CEMENT
CHEMICAL FAMILY: NA - MIXTURE OF PVC RESIN & ORGANIC (ETHER, & KETONE) SOLVENTS	FORMULA: NA

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	WT. %	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS: NONE			BASE METAL		
CATALYST: NONE			ALLOYS		
VEHICLE: PVC RESIN MIN.	10	-	METALLIC COATINGS		
SOLVENTS: SEE BELOW			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
THF) MAJOR COMPONENT TLV 200 PPM. CALCULATED FOR MIXTURE 200 PPM		
MEK) 200 PPM		
CYCLOHEXANONE (VERY MINOR) 50 PPM		

SECTION III PHYSICAL DATA

BOILING POINT (°F.) LOWEST BOILING COMPONENT (THF)	151°F	SPECIFIC GRAVITY (H_2O=1)	0.906±0.003
VAPOR PRESSURE (mm Hg.) (THF) @ 25°C	190	PERCENT VOLATILE BY VOLUME (%) APPROX.	90%
VAPOR DENSITY (AIR=1)	2.49	EVAPORATION RATE (BUAC = 1)	5.5 to 8
SOLUBILITY IN WATER (SOLVENT PORTION)- PVC RESIN------Precipitates			
APPEARANCE AND ODOR: CLEAR, THIN SYRUPY LIQUID, ETHERAL ODOR.			

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
(T.O.C.) 15°F		1.8	11.8

EXTINGUISHING MEDIA: DRY CHEMICAL, CARBONDIOXIDE, FOAM - ANSUL "PURPLE K" - NATIONAL AER-O-FOAM.

SPECIAL FIRE FIGHTING PROCEDURES: CLOSE OR CONFINED QUARTERS REQUIRE SELF CONTAINED BREATHING APPARATUS. POSITIVE PRESSURE HOSE MASKS OR AIRLINE MASKS.

UNUSUAL FIRE AND EXPLOSION HAZARDS: FIRE HAZARD BECAUSE OF LOW FLASH POINTS, HIGH VOLATILITY AND HEAVY VAPOR.

SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: 200 PPM

EFFECTS OF OVEREXPOSURE: SEVERE OVEREXPOSURE MAY RESULT IN NAUSEA, DIZZINESS, HEADACHE, CAN CAUSE NARCOSIS, IRRITATION OF EYES AND NASAL PASSAGES. NORMAL DEFATTING EFFECT OF SOLVENTS ON TISSUE.

EMERGENCY AND FIRST AID PROCEDURES
VAPORS: REMOVE TO FRESH AIR.

LIQUID: REMOVE CONTAMINATED CLOTHING & WASH SKIN WITH WATER. FLUSH EYES WITH PLENTY OF WATER FOR 15 MINUTES - CALL PHYSICIAN, IF SWALLOWED, INDUCE VOMITING-CALL PHYSICIAN.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID: KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME.
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*: CAUSTICS, AMMONIA, INORGANIC ACIDS

HAZARDOUS DECOMPOSITION PRODUCTS: CHLORINE GAS AND HYDROCHLORIC ACID FROM POLYVINYLCHLORIDE
CARBON MONOXIDE, CO_2

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID: KEEP AWAY FROM HEAT, SPARK & FLAME
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: ELIMINATE ALL IGNITION SOURCES - AVOID BREATHING OF VAPORS. KEEP LIQUID OUT OF EYES. FLUSH WITH LARGE VOLUME OF WATER.

WASTE DISPOSAL METHOD: INCINERATE - EXCESSIVE QUANTITIES SHOULD NOT BE PERMITTED TO ENTER DRAINS WHERE THERE IS DANGER OF VAPOR BECOMING IGNITED.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*: NONE REQUIRED WITH NORMAL VENTILATION. USE RESPIRATOR FOR ORGANIC VAPORS FOR CONFINED AREAS, e.g. MINE SAFETY APPLIANCE-RESPIRATOR-CAT.NO.85566.

VENTILATION	LOCAL EXHAUST: (PREFERABLE) PROVIDE NORMAL VENTILATION	SPECIAL: -
	MECHANICAL *(General)*: LOW POINT - 6 AIR CHANGES PER HOUR.	OTHER: -

PROTECTIVE GLOVES: RUBBER OR PVA GLOVES ARE SUITABLE

EYE PROTECTION: CHEMICAL SAFETY GOGGLES

OTHER PROTECTIVE EQUIPMENT: IMPERVIOUS APRON

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING: KEEP AWAY FROM HEAT, SPARKS AND OPEN FLAME. AVOID PROLONGED BREATHING OF VAPOR. AVOID SKIN CONTACT - STORE BETWEEN 40 & 110°F.

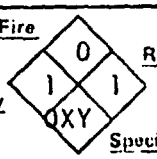
OTHER PRECAUTIONS

Mogul WS-164

MOGUL
DIVISION OF THE DEXTER CORPORATION
Chagrin Falls, Ohio 44022
(216) 247-5000

NATIONAL FIRE PROTECTION ASSOCIATION (NFPA)

HAZARD RATING
4 = EXTREME
3 = HIGH
2 = MODERATE
1 = SLIGHT
0 = INSIGNIFICANT
* = CHRONIC HEALTH HAZARD - SEE SECTION V



MATERIAL SAFETY DATA SHEET

SECTION I

027

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Polymer/Phosphonate/Chromate Solution	MOGUL WS-164
CHEMICAL FAMILY: Industrial Water Treatment: Corrosion Inhibitor	FORMULA: Proprietary Mixture

SECTION II – HAZARDOUS INGREDIENTS

MATERIAL	CAS #	%	TLV (units)
Sodium dichromate dihydrate	10588-01-9	1.2	0.05 mg/m^3 (as Cr)
Tolyltriazole (oral LD_{50} rat - 675 mg/kg)	29385-43-1	1.5	Not Estab.
Sodium hydroxide	1310-73-2	8.1	2 mg/m^3 C

SECTION III -- PHYSICAL DATA

BOILING POINT (°F)	like water	SPECIFIC GRAVITY (H_2O=1)	1.104
VAPOR PRESSURE (mm Hg.)	like water	PERCENT, VOLATILE BY VOLUME (%) approx.	75
VAPOR DENSITY (AIR = 1)	like water	EVAPORATION RATE (_____ = 1)	like water
SOLUBILITY IN WATER	complete	pH	12.0-12.5

APPEARANCE AND ODOR: Brown liquid

SECTION IV – FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method Used)	FLAMMABLE LIMITS	Lel	Uel
Not Applicable (NA)	NA		

EXTINGUISHING MEDIA: Water, CO_2, dry chemical, foam

SPECIAL FIRE FIGHTING PROCEDURES:
Keep drums, exposed to fire, cool with water.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Contains dichromate, an oxidizer. In fire, if water is driven off, product may ignite or explode in presence of combustible materials.

SECTION V – HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: Not established for mixture

EFFECTS OF OVEREXPOSURE:
Alkaline material: Will burn or damage eyes, skin and mucous membranes. Contains dichromate, an irritant of the eyes, nasal septum and respiratory tract. Repeated or prolonged exposure to dichromate may cause ulceration and perforation of the nasal septum. Contact with broken skin may cause firmly margined "chrome sores." Dichromate can be absorbed by the skin. Massive overexposure by ingestion or skin absorption could cause electrolyte imbalance, kidney failure and death.

EMERGENCY AND FIRST AID PROCEDURES:
SKIN: Flush with water, then wash thoroughly with soap and water. EYES: Flush with water for 15 minutes and get medical attention if an irritation persists. INGESTION: Drink plenty of water, and call collect (412) 681-6669 or consult physician immediately. Avoid alcoholic beverages.

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FOR MEDICAL EMERGENCY CALL COLLECT (412) 681-6669

(continued on reverse side)

OSHA: Rev. 1/84

SECTION VI – REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	

INCOMPATABILITY (Materials to avoid)

Organic, combustible or oxidizable materials; strong acids.

HAZARDOUS DECOMPOSITION PRODUCTS

Nitrogen oxides, carbon monoxide, carbon dioxide and/or hydrogen cyanide possible upon thermal decomposition.

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII – SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Contain spill if without risk. Use inert absorbent material such as sand or clay to soak up and place in empty drums. Do not use sawdust or other combustible absorbent. Wash area with soap and water.

WASTE DISPOSAL METHOD

Qualifies as a RCRA hazardous waste due to pH and presence of chromate in excess of 5 mg/l. Dispose at authorized waste disposal facility in accordance with local, state and federal requirements.

SECTION VIII – SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type)

Usually not required

VENTILATION		
	LOCAL EXHAUST: Recommended	SPECIAL
	MECHANICAL (General)	OTHER

PROTECTIVE GLOVES	EYE PROTECTION
Rubber	Chemical safety glasses or goggles

OTHER PROTECTIVE EQUIPMENT

Rubber apron if splashing is likely

SECTION IX – SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Avoid skin and eye contact. Do not take internally. Keep container closed when not in use. Wash thoroughly after handling. Do not return spilled material to original container; remove and dispose. Do not inhale vapors or mists.

OTHER PRECAUTIONS

Wash after handling, and before eating, drinking and smoking.

Refer to "Mogul Product Safety and Handling Glossary of Terms" for additional information.

FOR MEDICAL EMERGENCY CALL COLLECT (412) 681-6669